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The fisheries and fishery industries of



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UNITED STATES COMMISSION OF FISH AND FISHERIES
SPENCER F. BAIRD, COMMISSIONER

THE FISHERIES
AND
FISHERY INDUSTRIES
OF THE
UNITED STATES

PREPARED THROUGH THE CO-OPERATION OF THE COMMISSIONER OF FISHERIES
AND THE SUPERINTENDENT OF THE TENTH CENSUS

BY

GEORGE BROWN GOODE
ASSISTANT SECRETARY OF THE SMITHSONIAN INSTITUTION
AND A STAFF OF ASSOCIATES

SECTION III
THE FISHING GROUNDS OF NORTH AMERICA
WITH FORTY-NINE CHARTS
EDITED BY RICHARD RATHBUN

WASHINGTON
GOVERNMENT PRINTING OFFICE
1887

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LETTER OF TRANSMITTAL.

UNITED STATES NATIONAL MUSEUM,

Washington, July 18, 1882.

SIR: I have the honor to transmit herewith, for approval and for publication, Section III of a general work upon THE FISHERIES AND FISHERY INDUSTRIES OF THE UNITED STATES, consisting of a description of the fishing grounds of North America, prepared by Capt. J. W. Collins, Mr. Richard Rathbun, Mr. Silas Stearns, Prof. D. S. Jordán, Dr. T. H. Bean, Mr. F. W. True, and Mr. Ludwig Kumlien. The work is edited by Mr. Richard Rathbun. It is the only report of the kind ever written. It describes the locations, the characteristics, and the productiveness of the numerous grounds resorted to by the fishermen of the United States, extending from Greenland to Mexico, from Lower California to Alaska, and including the fishing grounds of the Great Lakes. The accompanying charts illustrate the fishing grounds and the surface ocean temperatures of the eastern coast of North America.

I have the honor to be, very respectfully, your obedient servant,

G. BROWN GOODE.

Prof. SPENCER F. BAIRD,

United States Commissioner of Fish and Fisheries.

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INTRODUCTION.

BY RICHARD RATHBUN.

The term "fishing ground" is commonly applied to any area in which fishing is carried on, whether the fish are taken at the surface or at the bottom, whether near the coast or at a considerable distance from it. The regions traversed by the mackerel and menhaden, in their periodical migrations, during the spring, summer, and fall, are classed as the mackerel and menhaden grounds, and, in the popular mind, belong in the same category with those well-defined elevations and depressions of the sea bottom which are the constant resort of cod and halibut and other bottom-feeding species. We also speak of the fishing grounds for herring, lobsters, shrimps, oysters, and sponges, although those species are taken mostly near the shores, while the cod and halibut grounds are sometimes distant from them several hundred miles.

The main purpose in preparing this section of the Fisheries Report has been to describe that class of North American fishing grounds to which the term more properly belongs, or those areas of the sea bottom which are known to be the feeding or spawning grounds of one or more species of edible fishes, and which afford fisheries of greater or less extent. The most important grounds of this character are located off the eastern coast of North America, between Nantucket and Labrador, this region furnishing by far the most important cod and halibut fisheries of the world, and including the large and well-known offshore banks, extending from George's, at the southwest, to the Flemish Cap, off the eastern coast of Newfoundland. These banks form an almost continuous series of broad, submarine elevations, stretching a distance of 1,100 geographical miles, and with a varying width of 50 to 250 miles. They attracted the attention of early navigators, and in the period of the first-attempted settlements on the adjacent shores of North America, now included in the British coast Provinces, were regarded as one of the greatest sources of wealth then known to the world. The principal maritime nations of Europe soon became interested in developing the newly-discovered fisheries, France apparently taking the most active part, and every year large fleets of vessels were sent to fish upon the banks. Colonies were established in connection with the enterprise, and the influence of the Great Banks upon the early settlement of some portions of our northeastern coast has probably never been estimated at its true value by historians.

It is now nearly four hundred years since these grounds were first fished upon by Europeans, and their resources are still unfailing; but the fishing interests have been mainly transferred to the New World, France alone of European countries having continued to send fishing vessels across the Atlantic down to 1880. Since then, however, the Portuguese have begun to exhibit some activity in connection with the cod fishery of the Grand Bank, and in the spring and summer of 1885 bought several New England fishing schooners and fitted out others from home ports. Their voyages proving generally successful, they have added more vessels to their fishing fleet during the latter part of this year, and it is quite possible that, in the course of a few seasons, they will have firmly re-established themselves in the fisheries of the Western Atlantic. The

French fishermen visit principally the Grand Bank, Saint Pierre, Banquereau, and certain portions of the coast of Newfoundland, on which they have long possessed the right to fish by treaty with Great Britain. Much English capital is invested in the Provincial fisheries, and vessels of other nations than the French and Portuguese come to this country to load with fish for foreign markets, but few, if any, ever engage in fishing.

The great offshore banks are now chiefly resorted to by the fishermen of New England and the British maritime Provinces, the latter including Nova Scotia, New Brunswick, Prince Edward's Island, Lower Canada, and Newfoundland, but the Provincial fishermen seldom venture as far south as George's Bank, which is frequented mostly by Gloucester vessels, and a few halibut catchers from Southern New England.

The most distant grounds visited by the fishermen of the United States, at the time this report was prepared, are located in Davis Strait, in the vicinity of Holsteinborg, on the west coast of Greenland, about 67° north latitude. They consist mainly of rocky banks, with patches of sand and mud, the depths of water ranging from 20 to 50 fathoms, and abound in halibut, but cod are scarce, and are taken only in small quantities. In 1884, acting upon information furnished by the United States Fish Commission, three Gloucester vessels made excellent halibut trips to the fishing banks of Iceland, and in the summer of 1885 four vessels from the same port obtained full fares on the Iceland grounds. Fishing is reported to be more profitable than in Davis Strait, and this region will probably prove very attractive in the future. Very few United States vessels now go either to the coasts of Labrador or Newfoundland, or to the Gulf of Saint Lawrence. No fares of halibut have been taken in those regions since 1881, and during the six years preceding that date the amount obtained was very small. About 12 or 15 cod fishermen still resort to the Gulf of Saint Lawrence every summer, but the mackerel fishery has been mostly transferred to the open waters on our own coast. The mackerel fleet in the Gulf of Saint Lawrence from United States ports has, during the past 8 or 10 years, seldom numbered more than 40 or 50 vessels, and during the same period the catch in those waters has probably not exceeded 3 per cent. of the total catch of the United States fleet.

The fishing grounds indicated on the charts representing the Gulf of Maine, and the coast-lines of Maine, New Hampshire, and Massachusetts, are mostly small banks, ledges, and shoals, with rocky, stony, gravelly, and sandy bottoms, separated by tracts of mud and sand. Upon the elevations, cod, haddock, pollock, and cusk abound, while the muddy areas between constitute the best known localities for the capture of hake. Although individually of relatively small size, compared with the offshore banks, these grounds form in the aggregate a very extensive and valuable fishing region, of much importance to the smaller class of fishing vessels and the boat-fishermen. From Nantucket westward and southward, to the Gulf of Mexico, the fishing grounds of the same class are much less numerous than at the north, more widely separated, and often entirely wanting over long distances; they are also generally less defined, especially as regards differences in the depth of water, and bottom fishing is not carried on to nearly as great an extent.

At the southern extremity of Florida good bottom fishing is obtained on the edge of the Gulf Stream, and among the coral reefs, by the Key West market fleet. In the Gulf of Mexico there is a broad belt of fishing ground, following the general contour of the coast and extending from the Tortugas Keys nearly to the mouth of the Mississippi River. It has a greatly diversified bottom, consisting in some places of ledges, in others of sandy, shelly, muddy, and rocky bottoms, traversed by gullies, and living corals are said to be abundant on many portions. Fishing is conducted in depths of 5 to 40 fathoms, the principal species taken being the red and black groupers and the red snapper.

On the Pacific coast the sea fisheries have as yet been but little developed, and such as exist are mainly carried on along shore. No attempts are made to discover offshore grounds, probably because of the scarcity of markets for the sale of fish. The principal fisheries between the Straits of Fuca and Lower California are in the neighborhood of San Francisco, but the grounds resorted to do not extend seaward beyond the Farallone Islands. In Alaskan waters sea fishing is pursued mostly by the natives, but rich cod and halibut grounds exist in that region.

Of special sea fisheries, the mackerel, menhaden, and sponging grounds have been briefly treated, and accounts of the fishing grounds of the Great Lakes have also been admitted into this section. The mackerel and menhaden grounds furnish ocean fisheries of great magnitude, in the same general region in which are located many of the more important inshore fishing banks and ledges of the northeastern coast of the United States, and are frequented by large fleets of vessels built and equipped expressly for the purpose. The lake grounds are all situated comparatively near shore, but often extend into considerable depths of water; they are seldom characterized by any peculiarities in the nature of the bottom, but are generally favorable localities for the setting of nets, or passage-ways used by the fish in moving from place to place. The principal kinds of fish taken are the lake-trout and whitefish, the appliances used being chiefly pound-nets, gill-nets, and seines. In some places, as at the Sault de Ste. Marie, dip-nets are employed from canoes in the capture of whitefish, and some hook-and-line fishing is also done.

In locating and defining the various fishing grounds, the writers have resorted both to brief descriptive accounts and to sketch maps or charts, the latter being employed only where the grounds are sufficiently well known to permit of their being plotted with at least approximate accuracy. This has been possible for almost the entire eastern coast of North America, but that region alone has been thus graphically represented.

The information upon which the report is based was derived from many sources. The fishing grounds of Davis Strait were visited in 1879 by Mr. N. P. Scudder, then an assistant on the United States Fish Commission; and he has prepared a full account of his trip, from which we extract that portion bearing upon the cod and halibut banks, adding a few notes made by other observers. The map of the same region was also furnished by Mr. Scudder. As to the inshore grounds of the British coast Provinces and the grounds of the Gulf of Saint Lawrence, we have relied in part on Canadian fishery reports, in part on accounts received from United States fishermen, who have repeatedly visited that region.

The outlines and principal contours of the offshore banks, from the Flemish Cap to, and including, Brown's Bank, have been taken mainly from the British Admiralty charts, and those of George's Bank from the charts of the United States Coast Survey. The data respecting the characteristics of those banks, their productiveness and their history, were almost entirely brought together by Capt. Joseph W. Collins, whose personal experiences for many years in the fisheries of every part of that extensive region entitle his statements and opinions to our fullest confidence. The same author is also to be credited with obtaining most of the information concerning the fishing grounds of the Gulf of Maine and the New England coast north of Cape Cod, many of these grounds having likewise come within his personal observation. The account for Southern New England, New York, and New Jersey was prepared from information procured by Mr. R. Rathbun directly from reliable authorities, and that for the Southern Atlantic coast mainly from the observations of Mr. R. E. Earll. The report upon the fishing grounds of the Gulf of Mexico was furnished complete by Mr. Silas Stearns, of Pensacola, Fla., one of the best informed authorities on the sea fisheries of our southern coast. Prof. D. S. Jordan, who reports upon the western coast of the United States, and Messrs. Kumlien and True, who prepared the account for the Great Lakes,

based their descriptions on observations made while investigating the fisheries of those regions, on behalf of the fishery census of 1880. Dr. T. H. Bean's report upon Alaskan resources and fishing grounds is the result of studies made upon numerous collections of fishes received from that Territory, from time to time, during many years, supplemented by personal observations in the field during a trip to Alaska in 1880.

With respect to the fishing grounds of Eastern North America, a few additional words of explanation are necessary. The outlines of a fishing ground seldom conform to the contour lines used on hydrographic charts to define the limits of a bank, ledge, or other inequality of the sea bottom, as the fishes are not always influenced so much by differences in the depth of water (within certain limits) as by the abundance of food or other essential conditions, among which temperature probably enters as an important factor. A fishing ground may, on one side, have a less depth than 25 or 30 fathoms, and on the other descend to depths of 50, 60, or even, in some cases, several hundred fathoms, the same species of fish sometimes occurring at both extremes. Many of the data furnished by the ordinary class of hydrographic work are, therefore, entirely unsuited to fishery purposes, and it is of the greatest importance that special surveys be undertaken in the immediate interest of the fisheries, and with the object of ascertaining the full extent and character of all the larger grounds that may be profitably resorted to by our fishermen. Fishing grounds are constantly changing in productiveness, and any survey bearing upon them should be made continuous, in order that the changes may be noted and their causes explained, if possible.

Such a work as this belongs within the province of the now existing United States Commission of Fish and Fisheries, and so far as the means at its disposal have permitted, its researches in this particular have been carried on with thoroughness and precision. Until within a very few years, however, this Commission was provided only with small vessels, with which it was impossible to extend the explorations much beyond those areas commonly entitled the inshore grounds, or beyond the boundaries of the United States. In 1883, the Commission was, for the first time, supplied with a thoroughly reliable sea-going steamer, capable of visiting any part of the oceanic grounds, and it has already collected many important data bearing upon the great banks of the northeastern coast, the mackerel and menhaden grounds, and the fishing areas of the Gulf of Mexico. New fishing grounds of great value have already been discovered, and new species of edible fishes have been introduced to the markets; but this work, so far as the steamer *Albatross* is concerned, has only just begun, and in the near future may be expected to add greatly to our knowledge of the fishery resources of our country. The series of investigations by the *Albatross* being entirely subsequent to the preparation of this volume, no account of it will be found on the following pages.

The above remarks will serve to indicate how difficult it is to locate, and especially to plot with distinct outlines, many of the fishing grounds along our coast, particularly as very few of the inshore grounds are in any way indicated on the Coast Survey charts. For those that have been previously marked out, as in the case of defined banks and ledges, we have relied in part on published charts, in part on information furnished by fishermen, by means of which latter it has often been possible to greatly perfect the outlines. The work of plotting nearly all the inshore grounds has been first attempted in connection with this volume, the data having been mostly obtained directly from the fishermen who are constantly resorting to them, and some of whom have drawn the outlines themselves. Every precaution has been taken to procure such information only from reliable persons, and to verify the same by other means wherever possible; and although it is not expected that absolute accuracy has been reached in all cases, especially as regards distances, the fishermen having to rely mainly on their judgment in this matter, it is probable that the positions

and outlines assigned to the grounds are, in the main, correct. In resorting to offshore grounds, the fishermen make use of a patent log for determining distances, and also ascertain their positions by observations for latitude and longitude, and their statements respecting localities at a distance from shore are as reliable as could be obtained from any source.

The limited time available for the preparation of the account of the fishing grounds of Eastern North America prevented the incorporation of materials bearing upon their temperature, currents, and general natural history characteristics—subjects that cannot be ignored in the study of the fishery resources of any region. Many data of this character have been obtained by the United States Fish Commission, and, although some of them have been already published in brief reports, the greater portion are still in process of elaboration, and will be issued at a future date in such form as to conveniently supplement this report.

The text composing this section was finished and sent to the printer in 1882. Delays in printing and in the preparation and engraving of the charts have enabled the writers, in connection with the latter, to add much information obtained since 1880, especially respecting the cod and halibut fisheries of the large offshore banks. This new material is contributed by Captain Collins, and is the result of studies continued through many years, and based mainly upon his own observations and those of the Gloucester fishermen directly concerned in the facts recorded. It brings the history of the more important cod and halibut fisheries down to the spring of 1885, and notes the principal changes that have taken place in recent years in the character and richness of the different parts of the offshore banks.

The charts have been drawn by Mr. C. E. Gorham, assistant on the United States Fish Commission, and engraved by the Photo-Engraving Company of New York. All distances recorded with respect to the eastern coast of North America are in nautical miles.

WASHINGTON, *December 30, 1885.*

[NOTE.—Since this introduction was put in type it has been found possible to add to this report a brief discussion of the surface ocean temperatures along the Atlantic coast, with a series of thirty-two graphic charts, which are given at the end of this section.]

LIST AND EXPLANATION OF THE CHARTS REPRESENTING THE SEA FISHING GROUNDS OF THE EASTERN COAST OF NORTH AMERICA.

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2. EXPLANATIONS OF CHARTS 3, 4, AND 5.

The following notes are based on data mainly obtained previous to 1880, but, unfortunately, not available at that time for insertion in the body of the text, to which they now serve as an appendix. They have reference, for the most part, to the extensive halibut and cod fisheries of the important banks lying off the coasts of the British maritime Provinces, and are intended more especially to call attention to certain localities in which good fishing had been obtained down to the close of 1879, or the early part of 1880, the year in which the investigations respecting them were mostly made. A few facts of more recent date have also been added. The years in which good fares were obtained are generally mentioned, and these explanations, in connection with the charts to which they relate, furnish, therefore, important data of historical interest, as well as regarding the relative value of different parts of the several fishing grounds in past years.

Changes are constantly taking place in the abundance of fish on all the large fishing banks. In many instances these changes are of only a temporary nature, and if fish are scarce one year, they may be abundant again the next. The halibut apparently furnish an exception to this rule, and good grounds, once depleted, have seldom been known to regain their former status. A few instances are, however, on record, where old and seemingly worn-out grounds have again afforded a good halibut fishery, but such cases are said to be rare, and the facts are regarded as favoring

* Refer to the pages of the text where the grounds are described.

the presumption that schools of halibut which have been thinned out and scattered by incessant fishing require at least many years to recover their former size, or even to show a perceptible increase. The history of the halibut fishery of the Great Banks covers a comparatively short period, and future observations may correct some of the prevailing opinions respecting that fishery. These remarks do not apply to the regular migrations of the halibut, which have been elsewhere discussed.

Fewer references are made to the localities of cod than to those of halibut fishing, and the former relate mainly to certain areas on the Grand Bank which are deserving of special notice. They also furnish an idea of the principal localities where fishing is carried on in the different seasons, and the character of the bait used in different places.

Special localities are designated by Roman numerals to facilitate reference. All of the fishing schooners mentioned by name belonged to ports in the United States and most of them hailed from Gloucester, Mass.

CHART NO. 3.—THE BANKS OF NEWFOUNDLAND.

Bank of Saint Pierre.—Cod and halibut, although once abundant on this bank, were scarce during the few years immediately preceding 1880, and during that period not a single fare of halibut was taken in depths of less than 70 to 100 fathoms, and no good cod fishing was obtained there by American vessels. Since 1880, however, cod have apparently returned to Saint Pierre in as great abundance as ever, and we understand that several vessels from New England secured good fares there in a short time, during 1883 and 1884. Halibut were still scarce up to the last-mentioned date. From 1865 to 1872 this bank was much resorted to for halibut. The spots inclosed by the dotted lines marked I on this chart, and XIV on the chart of the Gulf of Saint Lawrence, were formerly good halibut grounds, but these are not the only localities where this species was taken on the bank.

I. The space inclosed by the dotted line is the so-called "Southern Shoal Water" of the Bank of Saint Pierre, and was formerly the most important halibut ground on the bank.

II. In this position, in a depth of 140 to 170 fathoms, halibut were abundant in 1878, and from May to September of that year the schooner Gwendolen took four or five good fares on a small area of hard bottom, surrounded by mud. Halibut have occasionally been taken since then, but are less common than when the place was first discovered.

Green Bank.—The gullies separating Green Bank from Saint Pierre and the Grand Bank, and the extensive deep plateau that extends from Saint Pierre to the Grand Bank, along the southern border of Green Bank, constitute together one of the most important halibut grounds that has been recently discovered. In their spring migrations, the halibut follow nearly along the course indicated by the dotted line running along the edge of the Grand Bank to the Bank of Saint Pierre. Since the deep-water halibut fishery was begun, in 1875, halibut have been abundant along the edge of the slope south of Green Bank, and have generally been most numerous from February to May. In some years they have been plentiful all summer and even in the fall. In the fall of 1882 one or more good fares of cod were obtained just south of this bank, in 65 fathoms of water.

III. The schooner Nathaniel Webster caught a fare of 80,000 pounds of halibut in this position, in March, 1879, and many other large fares have been taken in the same locality.

IV. Excellent fishing ground for halibut, in depths of 90 to 140 fathoms, from May to October, 1875. In April, 1876, halibut were again very abundant in 80 to 90 fathoms, and were noticed to be moving slowly westward along the edge of the ground. In the position marked, the schooner Howard took a fare of 95,000 pounds of halibut in a few days, and eight or ten other vessels obtained fares at the same time, ranging from 75,000 to 115,000 pounds each. Halibut were found here again, March 25, 1877, March 15, 1878, and February, 1879. In the years succeeding 1875, halibut, though abundant in the late winter and spring, were generally scarce in the summer and fall. In 1882, however, they were exceedingly plentiful during the entire summer and a part of the fall.

V. Halibut abundant in October, 1875.

VI. Large catches of halibut made in April, 1877.

The Grand Bank or Great Bank of Newfoundland.—VII. Good halibut fishing found by the schooner Ocean Belle at this place, in 52 fathoms, in April, 1877.

VIII. First fishing for fresh halibut on the Grand Banks in upwards of 100 fathoms at this place, in April, 1875. The fish were very abundant in depths of 100 to 160 fathoms.

IX. Very good halibut fishing, February, 1879.

X. The schooner G. G. Kidder found halibut abundant here in the spring of 1874 in 90 fathoms, and obtained the first fare of fresh halibut taken in deep water on the Grand Banks.

XI. The area inclosed by the dotted line afforded excellent halibut fishing during several years, the season lasting from February until May. Since 1877 the fish have been scarce here.

XII. In March, 1877, the schooner Howard caught 25,000 pounds of halibut at this place in one day, in 55 fathoms.

XIII. Good halibut fishing, January and February, 1879.

XIV. Halibut very abundant March, 1876, and many good fares obtained. In May, 1879, the schooner Mary F. Chisholm secured a fare of 40,000 pounds.

XV. In the inclosed area many large fares of halibut were caught in February and March, 1866 and 1867. At the spot marked with the cross the schooner Centennial obtained 100,000 pounds in one trip.

XVI. The crosses indicate the position of the halibut fleet in January, 1878, where good fares were obtained in depths of 160 to 200 fathoms. Halibut were scarce here in 1879.

XVII. Halibut were very abundant in the positions indicated by the crosses in the springs of 1876 and 1877, and fine fares were obtained in 150 to 300 fathoms. The edge of the Grand Bank on this side, from its southern end to 44° north latitude, has been one of the best halibut grounds in the Western Atlantic ever since the discovery of the deep-water fishery, and many large fares have been taken at all seasons. The halibut are, however, somewhat erratic in their movements, and are not equally abundant at all times. Those found to the southward of latitude 44° north appear to be moving off from the bank into water too deep for the fishermen to follow them, and all trace of them is lost. North of latitude 44° north they seem to be working along the edge of the bank, and often it is not difficult to trace their summer migrations in the early part of the season.

XVIII. In this position the schooner Stirling, on a "salt trip," made a large catch of halibut in 130 fathoms in April, 1873. This is the first recorded instance of deep-water halibut fishing on the Grand Banks.

XIX. The area inclosed by the dotted line was a favorite halibut ground in the winter and spring for several years previous to the beginning of the deep-water fishery. The schools of halibut were generally migrating towards the west and northwest. This area also furnishes excellent cod-fishing, and is much resorted to by fishermen from the United States, the British Provinces, and France. In the space inclosed at its southern end, and marked "Good Cod Grounds"—cod were very abundant in June, 1877. Good cod-fishing is still found here almost every summer, but halibut are no longer taken in any considerable numbers.

XX. In the position indicated by the cross many fine fares of halibut were caught prior to 1875. This locality is noted for the exceedingly large fare obtained by the schooner Mary Carlisle, in April, 1871, which paid the crew shares of \$236 each, the largest ever realized from a fresh halibut trip.

XXI. Halibut abundant in January, 1876.

XXII. This ground, known as the "Eastern Shoal Water," was chiefly resorted to for halibut from 1864 to 1871. After 1869, however, but few halibut were caught here except in the fall. Good fall trips were made as late as 1874. The dotted cross in the western part of the inclosed area indicates where the schooner Mary G. Dennis took a large fare in the spring of 1868, and that in the southeastern part where the schooner N. H. Phillips, in October, 1871, obtained a fare that realized one of the largest stocks ever made on a fresh halibut trip up to that date. Up to within a few years of 1880, the Eastern Shoal Water was also a favorite place for cod in the fall, and sometimes at other seasons. Of late it has not been as much resorted to as formerly. It was on this ground that the "giant squid" were found in such large numbers in the fall of 1875.

XXIII. Halibut were abundant along this edge of the bank in 1881 and 1882, between 43° 30' and 44° 15' north latitude, and in depths of 125 to 300 fathoms. The prevalence of icebergs and the strength of the Arctic current, render fishing here very difficult and dangerous.

XXIX. Halibut were abundant on and near the Virgin Rocks during the summers from 1868 to 1870, inclusive, and several large fares were obtained. Since 1871 no catches of importance have been made. The Virgin Rocks have been for many years a favorite locality for hand-line dory fishermen engaged in the cod fishery, and in the summer a fleet of vessels lies near the shoals, each one sending out from 10 to 25 dories. The cod average somewhat smaller than on other parts of the Grand Banks, being such as are called "mixed fish" in New England.

XXX. Good cod fishing obtained on trawls with salt clam bait and "shack," April, 1879.

XXXI. Good catches of cod made with capelin bait in June and July, 1877 and 1878.

XXXII. Cod fishing with shack bait good in June and July, 1874 and 1878.

XXXIII. This ground nearly always affords good cod fishing from May to July, with herring, capelin, and squid bait. The fish were very abundant in June, 1879.

XXXIV. Cod very abundant in June, 1875.

XXXV. Good cod fishing with herring bait, May, 1879.

XXXVI. Good catches of cod with squid bait were made in August, 1879.

XXXVII. Good cod fishing with squid bait, July, 1879.

SEC III—II

XXXVIII, XXXIX. Good cod fishing with capelin bait, June, 1879.

XL. Good cod fishing with squid bait in August and September, 1879. The inclosed area north of this ground furnished an abundance of cod in July, 1878, when squid bait was used.

Barren ground.—Good fares of cod have been occasionally reported from this area, but we have not been able to obtain any reliable information respecting them.

CHART NO. 4.—THE FISHING BANKS OFF THE COAST OF NOVA SCOTIA.

Seal Island Ground.—This ground is now chiefly valued for the cod fishery which it affords from the first of May to October of each year. It is mostly resorted to by a large fleet of vessels hailing from ports in the vicinity of Cape Sable, Nova Scotia, and commonly called the "Cape Fishermen." These vessels spend most of the season fishing on this ground. A few United States vessels, fishing with hand-lines, frequently resort to it, and it was formerly a favorite locality for halibut, but is not at present.

I. Halibut were found in abundance at this place for a few days in June, 1878.

II. In this position, off the northwestern part of George's Bank, in depths of 110 to 160 fathoms, many good fares of halibut were obtained by hand-line fishermen in 1876 and 1877.

III. The schooner Alice G. Wonson made good fares of halibut in this vicinity, in depths of 160 to 200 fathoms, during several successive years preceding 1880. The prevalence of strong tides and the frequent parting and loss of trawl-lines by their becoming entangled in the large tree corals, *Paragorgia arborea* and *Primnoa reseda*, which are numerous on the bottom, have deterred others from fishing here, and no satisfactory results have been obtained by other vessels.

IV. In the fall of 1877, halibut were abundant along the region indicated by this dotted line, to the westward of Le Have Bank, but since then they have been scarce. The crosses at the eastern end of the line indicate positions where large fares of halibut were obtained from 1877 to 1879. At the easternmost position, the schooner Julia Wood caught 80,000 pounds of halibut in December, 1877. The depths fished in vary from 100 to 400 fathoms.

Sable Island Bank.—The Pot Ground, also called the "Tongue Ground," from its fancied resemblance to a tongue, is frequently an excellent locality for cod fishing in April and May. Since 1880, good fares of cod have been caught in depths of 60 to 90 fathoms on the edge of the bank, SE. by S. to ESE. from the eastern light of Sable Island. From 1852 to 1873 certain localities on Sable Island Bank, in depths of 30 to 60 fathoms, were much resorted to by the halibut fishermen, and since the discovery of the deep-water fisheries, in 1875-'76, many excellent fares have been obtained on the "fall off" of the bank along its southern and eastern edges.

V. This locality, on the eastern part of Sable Island Bank, was a favorite winter halibut ground from 1852 to 1873. It was fished on in the winter as late as 1877, but good fares have seldom, if ever, been taken since 1873.

VI. Several good fares of halibut taken between 1853 and 1868.

VII. Good halibut ground in 1852.

VIII. Good fares of halibut obtained between 1853 and 1873.

IX. Good halibut fishing at intervals from 1853 to 1870. The schooner William T. Merchant obtained a large fare here in February, 1868.

X. One fare of halibut has been taken on this steep incline, which slopes rapidly from 150 to 400 fathoms.

XI. The cross indicates a locality where many excellent fares of halibut were taken from 1877 to 1879, inclusive, in depths of 150 to 300 fathoms.

XII. One of the best deep-water halibut grounds on Sable Island Bank. Many good fares have been obtained; the bottom is covered with bush and tree corals.

XIII. The schooner Howard caught 45,000 pounds of halibut at this place in eight days, in August, 1877.

XIV. Good fares of halibut taken in 60 fathoms, in 1853.

XV. In this position, in July, 1877, the schooner William Thompson obtained a fare of 100,000 pounds of halibut, and the schooner Howard, fishing only six days, a fare of 82,000 pounds, in depths of 125 to 200 fathoms. Many other good fares have been taken in this vicinity at different seasons, and the edge of the bank, over a distance of more than 60 miles, was a favorite locality for halibut up to the close of 1879.

XVI. Position where the type specimen of the gold-banded bush coral, *Ceratoisis ornata*, was taken in 1878. This is one of the most rare and beautiful of the several species of corals obtained on the fishing grounds by the Gloucester fishing schooners.

XVII. Good fares of halibut obtained by the schooner Gertie E. Foster, in 1875-'76.

XVIII. Good fares of halibut taken in depths of 40 to 50 fathoms, from 1853 to 1855, inclusive.

XIX. The Gully is a celebrated halibut region. It extends from $58^{\circ} 58'$ to $59^{\circ} 57'$ west longitude, and from $44^{\circ} 04'$ to $44^{\circ} 27'$ north latitude. In its southern part, between $44^{\circ} 04'$ and $44^{\circ} 10'$ north latitude, there is located a small but important bank, described below. The crosses in the western part of the Gully, numbered XIX, indicate localities where halibut were found in abundance from 1874 to 1876, inclusive. The other crosses all refer to large catches of halibut made from 1877 to 1879, inclusive. In the three years last mentioned, enormous quantities of halibut were taken from this region, and to such an extent were its resources exhausted thereby that in the three or four years immediately following 1879 halibut were exceedingly scarce in the Gully, and during some seasons the fishing was quite unprofitable. In 1884-1885, however, a few good fares were obtained. The small bank in the southern part of the Gully, above mentioned, is separated from Banquereau and Sable Island Bank by narrow gullies, about 150 fathoms deep, the average depth of water upon the bank itself being about 100 fathoms, and the bottom consisting of coarse pebbles, gravel, and stones. Toward the northward the water deepens to 150 fathoms, and toward the south the bottom rapidly falls off to depths of 500 or 600 fathoms. Fishing was carried on in the Gully some years before the bank was discovered, and as it had never been surveyed or plotted on the charts, the fishermen supposed its position was occupied by deep water. It was probably first noticed about 1877, and during a few subsequent years exceedingly good halibut fishing was obtained along its southern edge; but the fish are much less abundant now than they were in the beginning.

Banquereau.—The cod obtained on this bank are, as a rule, small, and it is not as much resorted to now as formerly by fishermen from the United States. A limited number of hand-line dory fishermen and a few trawlers comprise the American fleet of cod fishermen. French vessels, using trawls, fish extensively on the bank north of $44^{\circ} 30'$ north latitude, but are seldom seen farther south. This bank is celebrated for its valuable halibut fisheries, which occur in the deeper water along the edges. The most noted of these are the "Southwest Prong" and the deep plateau off the eastern end.

XX. The first deep-water halibut caught on the Southwest Prong were taken in this position in 1876. The other crosses indicate where large catches were made from 1876 to 1879, inclusive.

XXI. Nearly 500,000 pounds of halibut were taken in this position, on a spot not more than one mile square, in the summer of 1879.

XXII. This locality, called the "Stone Fence" by the fishermen, is noted for the great abundance of corals growing on the bottom. On the Stone Fence and immediately to the north of it, many large fares of halibut have been caught in depths of 150 to 230 fathoms. This locality has shown less signs of becoming depleted than any other lying to the west of it.

XXIII. Halibut were abundant at this place in April, 1879, and several good fares were obtained.

Misaine Bank.—Scarcely anything has been known respecting the fisheries of this bank, and it has generally been regarded by the fishermen as comparatively barren ground. In the summer of 1885, the U. S. Fish Commission steamer Albatross, while engaged in explorations in this region, made a series of trials with hand-lines across the bank from its eastern to its western edge, and found cod fully as abundant as on any of the adjacent fishing grounds, and of as large size and good quality as are taken on Banquereau.

CHART NO. 5.—THE FISHING GROUNDS OF THE GULF OF SAINT LAWRENCE.

I. The first halibut taken on the coast of Anticosti Island were caught in this vicinity in 1869.

II. On this coast, between 61° and 62° west longitude, halibut were sometimes moderately abundant, close in shore, in the summer season prior to 1875. Since then no important catches have been made.

III. In the immediate vicinity of Red Island the fishing schooner Ocean Belle made a fare of 80,000 pounds of halibut in the summer of 1870. As explained in the text, however, this region is controlled by the French, and is not now resorted to by United States vessels.

IV. Moderately large fares of halibut were obtained at the Bay of Islands by American vessels in 1872 and 1874, but nothing of importance has been done since then.

V. The first catch of halibut at Green Point was made in June, 1871, by the schooner William T. Merchant, and in June and July of 1878 and 1879 several very large fares were obtained at the same place.

VI. A few small fares of halibut were obtained in the summer season about Bryon Island and on the shoal between the island and Bird Rocks. This region, however, has never been an important one for any of the Gulf fisheries.

VII. The area inclosed in the dotted line is the so-called "Flint Island Halibut Ground," on which fares of halibut were obtained from 1861 to 1875, especially during the months of May and June. Since the latter date, however, this ground has been practically abandoned by the halibut fishermen.

VIII. In 1861 the schooner Centre Point obtained a fare of 60,000 pounds of halibut in the narrow strait between Scatari Island and Cape Breton. This is supposed to be the first fare of halibut taken in this vicinity.

IX. In this locality the schooner Carl Schurz secured a fare of 90,000 pounds of halibut in April and May, 1879. Many other good fares have been taken in the same place, and also a short distance to the northwestward, in the winter and spring.

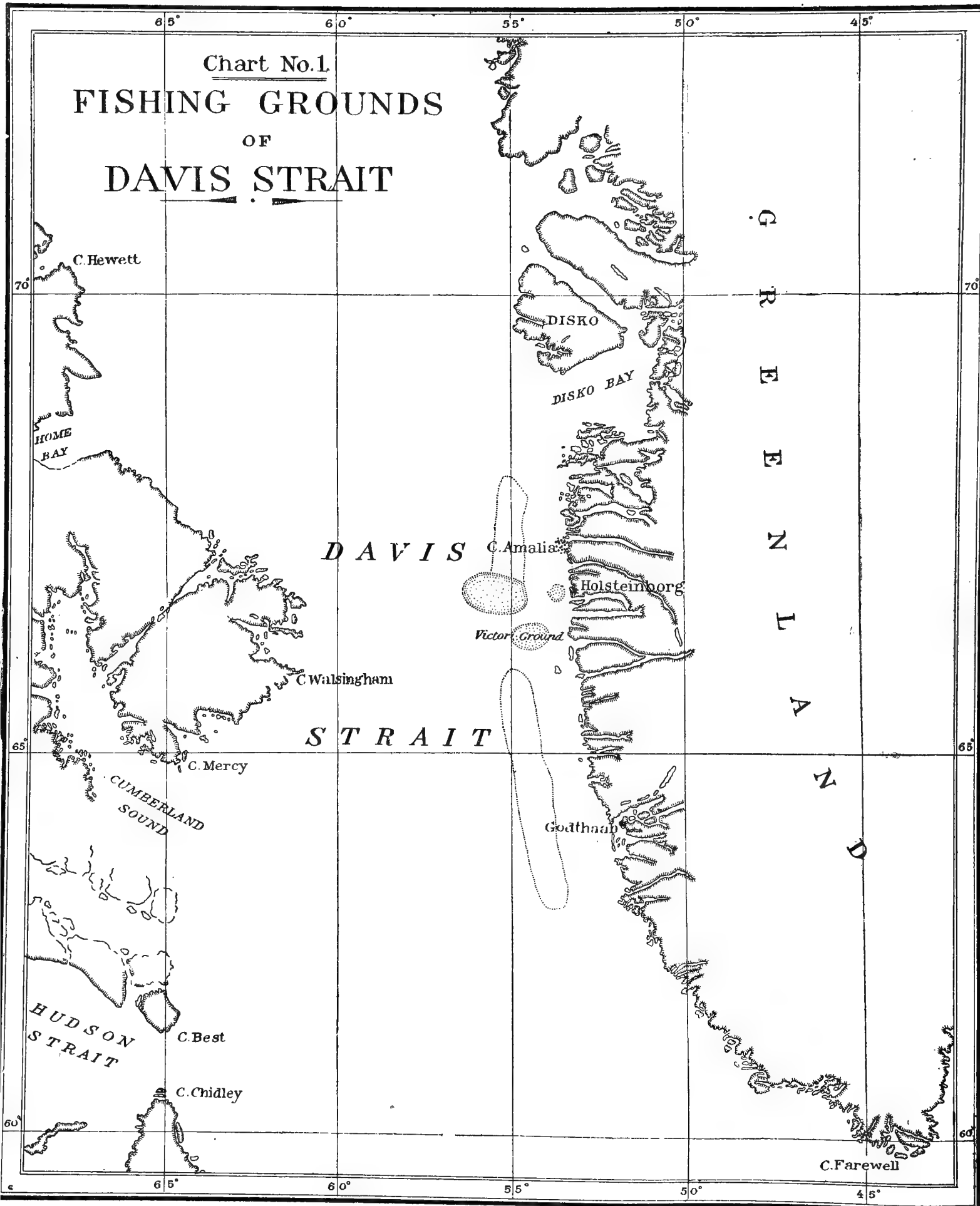
X. A fare of halibut was taken at this place by the schooner Centennial in May, 1878.

XI. A fare of 100,000 pounds of halibut by the schooner M. H. Perkins in May, 1879.

XII. Miquelon Beach halibut grounds. Halibut were very abundant here in the summer from 1868 to 1870, but have been scarce since then.

XIII. Pass Island halibut grounds. Fish were very abundant for two or three seasons, from 1870 to 1872, over an area not exceeding three miles across, and with a depth of about 160 fathoms. Many good fares were obtained, but the fish have been scarce since 1872.

XIV. Between 1865 and 1870 many halibut were caught on the northern part of Bank St. Pierre, within and near the dotted line.



THE FISHERIES AND FISHING INDUSTRIES OF THE UNITED STATES.

FISHING-GROUNDS.

A.—THE SEA FISHING-GROUNDS OF THE EASTERN COAST OF NORTH AMERICA FROM GREENLAND TO MEXICO.

BY CAPTAIN JOSEPH W. COLLINS AND RICHARD RATHBUN.

1. THE FISHING-BANKS OF DAVIS STRAIT.

The most distant fishing-banks resorted to by the American fishermen on the Atlantic coast are those of Davis Strait, off the coast of Greenland, which abound in halibut and also furnish some cod. They are not much visited by fishermen, on account of the short duration of the fishing season, the possibility of being detained by ice in the passage out, the uncertainty of obtaining a full fare, and the great distance of the grounds from the fishing ports. Notwithstanding all this, however, quite a number of successful trips by Gloucester halibut vessels are on record, and were the localities better known and better mapped out, they might develop into very profitable fishing-grounds. During the summer of 1879, Mr. N. P. Scudder, assistant on the United States Fish Commission, made a trip to this region on the Gloucester schooner "Bunker Hill," and from his report of the cruise we extract the following account of the fishing-banks and their chief characteristics.

From the want of proper surveys it is impossible to mark out, with any degree of accuracy, the exact position and entire extent of these fishing-banks. The Danish charts indicate a line of soundings just off the coast of Greenland, extending from near Disco Bay in the north (about latitude $68^{\circ} 15'$ north) to near Lichtenfels in the south (latitude $63^{\circ} 20'$ north), and ranging in depth from fourteen to seventy-five fathoms and more. Over very extended areas, however, the depths are not greater than thirty fathoms. It is more than likely that these soundings continue farther along the coast toward Cape Farewell, for the reason that icebergs become stranded there, but there is no indication of them on the charts. The distance of the center of this line of soundings from the Greenland coast is about twenty miles, and the fishing-grounds have been stated to lie from twenty to forty miles from land. Immediately outside of the banks, and on the inner side also, there is much deeper water, the slopes being often very abrupt. Only a small area of these fishing-banks have been visited by American fishermen—that portion lying between Holsteinborg and Sukkertoppen, and off Cape Amalia.

That halibut are to be found throughout their entire extent is more than probable, for the species is identical with that taken on the Grand Banks, and we should naturally infer that these fish would be found in all favorable situations within the limits of their distribution. It is also reported that Capt. Rasmus Madison, who has made several trips to Greenland, set his trawls for halibut farther to the south (probably off Godthaab) and found them very abundant, but was unable to secure many on account of the numerous ground sharks, which destroyed his trawls.

The depth of water on the banks ranges from twenty to fifty fathoms, and this makes fishing easier than on the Grand Banks, where halibut can be found abundantly only along the outer slopes in much deeper water. The inner edges of the banks slope abruptly, so as to form between the banks and the main-land a long and narrow submarine valley, whose depth has not been determined. The surface is of a varied character, though generally rocky, with sandy and muddy spots scattered here and there.

The fauna of the banks, as determined at the locality to which the Gloucester fishermen resort, by specimens brought up on their hooks, varies considerably in different localities, and often abruptly. Halibut would take the hook readily in certain places, and very seldom in others close at hand. The former areas were generally found to be covered with immense quantities of an Ascidian, called sea lemon, and the latter with miniature forests of tree corals (*Gorgonia*). When the fishermen struck the latter kind of bottom they were generally certain not to obtain many fish. While this coincidence may hold good for this one region, it cannot be considered of any importance alone, and the differences probably depend on some other unexplained causes. On the more southern fishing-banks, the presence of Gorgonian corals in no way interferes with the abundance of fish. An examination of the stomachs of the halibut captured in some places disclosed mostly crustaceans and in others mostly small fish. Halibut were the only edible fish caught in sufficient numbers to prepare for market. Some cod were taken, but not enough to pay for salting, and they were eaten on board.

According to Dr. Henry Rink,¹ cod do not spawn on the coast of Greenland. At any rate spawners are very rarely taken, and during the winter cod are wholly absent from the coast. "Sometimes in spring a great many quite young ones arrive at the inlets between 60° and 61° north latitude, which would seem to suggest that their breeding places were not far off, but they generally make their appearance after June 20 on the fishing-grounds, which are situated between 64° and 68° north latitude, at a distance of sixteen miles from the shore, and in July and August resort to the inlets up to about 70° north latitude. With regard to numbers, the occurrence of codfish on Greenland shores is peculiarly variable. Some years, or certain periods of few years, may prove extremely favorable as regards the catch; whereas others turn out a total failure. The number annually caught by the natives may be estimated at somewhat about two hundred thousand fish on an average." According to the same author, "the larger halibut (*Hippoglossus vulgaris*) occurs on the banks, as well as in different places outside the islands, up to 70° north latitude, in depths of from thirty to fifty fathoms. Of late the capture of this fish has become an object of commercial speculation, and foreign ships, chiefly American, have been engaged in it, apparently with better success than that of the codfishing. A halibut of this species weighs from twenty to one hundred pounds, and its flesh is fat and much valued. Superior in taste as well as fatness is the smaller halibut or 'Kaleralik' (*H. pinguis*²), which is angled for in the ice fiords at depths of about two hundred fathoms." The other edible fish mentioned by Dr. Rink as inhabiting these fishing-banks are as follows: The lumpfish (*Cyclopterus lumpus*), perhaps the fattest of the Greenland species, which goes inshore in April and May for the purpose of spawning, and forms at this season,

¹ Danish Greenland, its people and its products. English version. London, 1877.

² *Platusomatichthys hippoglossoides*.

during a couple of weeks, the chief food in certain places. "The Norway haddock (*Sebastes Norvegicus*) is found only in certain though pretty numerous grounds south of 80° north latitude. The capelin (*Mallotus villosus*) has from times of old yielded the most profitable fishery to the Greenlanders, and may, in a dry state, in winter time, frequently be said to have constituted the daily bread of the natives. They are shoveled on shore by means of small nets, by women and children, and spread over the rocks to dry during four weeks of May and June, when they crowd to the shores of inlets south of 70° north latitude to spawn. This fishery has now considerably decreased, but may still be considered to yield one and a half million pounds weight or more of undried fish yearly."

The best harbors for the fishermen resorting to these banks, in the regions now visited by American vessels, are those of Holsteinborg and Sukkertoppen. Both are good places of shelter. Holsteinborg, the only one visited by Mr. Scudder, is surrounded by the high mainland on three sides, and is shut in on the outer side by several islands. It is thus completely protected from rough water, and the only wind that can enter must come from the side toward the strait, from which direction there are seldom any severe blows. The depth of water is ten to twenty-five fathoms. Holsteinborg and Sukkertoppen are ninety miles apart, and, as the best fishing was found midway between them, there was a good opportunity for running into shelter whichever way the wind might blow. On most of the trips that have been made it has been necessary to make a harbor three, or even more, times a month, on account of severe southwest and northeast winds, which, combined with the strong tides in such shallow water, soon produce a heavy sea.

The best season for fishing on these Greenland Banks is during July and August, although August is preferable to July. This is due to the character of the weather, temperature, etc., at that time, as well as to the greater abundance of fish then on the passage to and from the banks. Mr. Scudder found the temperature during July to vary from 36° F. to 49° F., and during August from 38° F. to 52° F. The mean and maximum temperatures of the surface waters during these months were 38 $\frac{3}{4}$ ° F. and 43 $\frac{1}{4}$ ° F. The climate at this season is, therefore, very favorable for work. The harbor of Holsteinborg is usually open by the middle of May, and fishing might begin by the first of June if vessels were stationed at this place; but the ice coming down the east coast of Greenland blocks up the more southern harbors, and interferes with the passage of vessels north until at least the middle of June. Then, again, winter begins to set in during the last part of August, putting a stop to all operations until the next year. The only icebergs seen by Mr. Scudder came from the south.

The tidal currents are not regular, and near the edges of the banks are very complex. In this locality the tide runs up the strait much longer and with greater velocity than in the other direction. In fact, some days there was no tidal current at all down the strait, but during the time when this current should have been running the water remained slack for seven or eight hours; also, instead of changing every six hours it would do so only twice a day. The greater velocity of the tide running north compared with that running south is probably due to the existence of a regular current on the east side of the strait running up the coast of Greenland. This strong northern flow renders fishing impossible for five or six hours at a time; but as the period of slack is usually equally long, there need not be any great loss of time, as the fishermen can arrange to sleep during the flow and fish during slack water. The nights are light enough in this latitude in July to permit of fishing being carried on at all hours during the twenty-four. The tides and currents are not, however, as simple as the above account would seem to imply; often in changing the position of the vessel only a few miles, an entirely different combination of currents would be met with. The tides running out of the many fiords along the coast of Greenland make

themselves felt a long distance from the shore. The fish seem to take the hook best about the close of the strong tide, and then it is that both hand-lines and trawls are most successfully used.

Temperature observations of the air and water, on the Greenland Fishing-Banks, by Mr. Scudder.

[Latitude about 66° north.]

Date.	Time of day.	Depth.	Temperature.
1879.			°F.
July 6	3 to 4 p. m.	Air	38
		Surface	38½
		10 fathoms.....	37½
		20 fathoms.....	36½
		30 fathoms.....	35½
		40 fathoms (bottom).....	35½
July 7	3 to 4 p. m.	Air	40½
		Surface	38½
		10 fathoms.....	37½
		20 fathoms.....	36½
		30 fathoms.....	35½
		40 fathoms (bottom).....	35½
Aug. 2	7.30 to 8 p. m.	Air	44
		Surface	42½
		10 fathoms.....	39½
		20 fathoms.....	38½
		30 fathoms.....	38
		37 fathoms (bottom).....	37½
Aug. 5	7 to 7.30 a. m.	Air	46½
		Surface	41½
		35 fathoms (bottom).....	37
Aug. 8	6 p. m.	Air	45½
		Surface	43½
		24 fathoms (bottom).....	37½
Aug. 20	8 to 8.30 p. m.	Air	44
		Surface	43
		25 fathoms (bottom).....	38½

The last set of observations was taken about forty miles west-southwest from Holsteinborg.

2. THE ATLANTIC COAST OF LABRADOR.

The existence has been known, for a great many years, of very extensive fishing-grounds along the northeastern coast of Labrador, between latitudes 53° and 56° north. As early as 1758, these grounds were visited by American fishermen, and from the collection of the Massachusetts Historical Society for 1792 we extract the following brief description of that region, as obtained from Captain Atkins, who visited it in the former year (1758) :

“The coast is very full of islands, many of them very large, capable of great improvement as they have more or less fine harbors, abounding in fish and seal, water and land fowls, good land, covered with woods, in which are great numbers of fur beasts of the best kind. Along the coast are many excellent harbors, very safe from storms ; in some are islands, with sufficient depths of water for the largest ships to ride between, full of codfish, and rivers with plenty of salmon, trout, and other fish. The entrance of Hancock’s Inlet in 55° 50’ latitude ; a very fair inlet ; very little tide sets in or out ; from fifteen to twenty fathoms of water going in ; five hundred sail of ships may ride conveniently in this harbor secure from any storms. On the east side the harbor is a natural quay or wharf, composed of large square stones, some of prodigious bulk. . . . The harbor abounds in codfish, very large, that a considerable number of ships might load there without going outside, which may be cured on the shore and the quay, except in very high tides.”

Not very much, however, was ever made known regarding the North Labrador fishing-grounds until 1876. Prof. H. Y. Hind, who had explored them in the interest of the Newfoundland

Government, published a report of considerable length on their extent and character. From this report we have extracted the following more important facts concerning the region :

"The fishing-grounds on the Atlantic coast of Labrador as far north as Sandwich Bay have been occupied to a greater or less extent for one hundred and twenty years. Those extending from Sandwich Bay to Cape Harrison (Webeck) have also been visited by fishing craft for a generation or more; but north of Aillik, about forty miles from Cape Harrison, the coast has only been frequented by Newfoundland codfishing craft during the last fifteen years. . . .

"The leading characteristics of the coast northwest of Aillik are as follows :

"1. The shore line is deeply serrated by a constant succession of profound and narrow fiords, stretching from thirty to fifty miles into the interior.

"2. It is fringed with a vast multitude of islands, forming a continuous archipelago from Cape Hillete to Cape Mugford, averaging twenty miles in depth from the mouths of the fiords seaward,

"3. Outside of the islands, and about fifteen miles seaward from shore, are numerous banks and shoals, which form the great autumnal, spring, and summer feeding grounds of the cod; while outside the shoals there appears to be a second range of banks, which are probably their winter feeding ground.

"4. The island-studded area forms an immense codfishing ground, which covers between Cape Harrison (Webeck) and Cape Mugford a boat fishing-ground (exclusive of the banks or shoals outside) nearly as large as the combined area of the English and French boat fishing-grounds on the chart of Newfoundland.

"For the sake of distinction, I have styled the area under review 'The Northern Labrador fishing-grounds,' beginning at Cape Harrison (Webeck), and, for the present at least, terminating at Cape Mugford."

The following table by Professor Hind shows approximately the area of the boat fishing-grounds about the island of Newfoundland, as compared with those of Northern Labrador. From this table it will be seen that the area of the Northern Labrador fishing-grounds alone, exclusive of the banks, is equal to about five-sixths the entire area of the British and French boat fishing-grounds on the coast of Newfoundland. The area of the inner range of banks cannot be even approximately stated.

Comparative table of the Northern Labrador and Newfoundland Fishing-Ground areas.

[In geographical square miles.]

Cape Harrison to Mugford, 260 miles, average 20 miles deep 5,200

NEWFOUNDLAND BOAT FISHERY.

French shore, Cape Saint John via Cape Bauld to Cape Ray, 696 miles, by 3 miles deep, shore boat fishing	2,088
South shore of Newfoundland boat fishery, Cape Ray to Cape Race, 573 miles, by 3 miles deep, shore fishery	1,719
East shore of Newfoundland boat fishery, Cape Race to Cape Bonavista, 294 miles, 3 miles deep, shore fishery	882
Northeast shore of Newfoundland boat fishery, Cape Bonavista to Cape Saint John, 225 miles, 3 miles deep, shore fishery	675
Northeast shore of Newfoundland boat fishery, among islands in Bonavista Bay and Bay of Notre Dame, 120 miles, 7 miles deep	840
Area of British Newfoundland boat fishery	4,116
Area of French Newfoundland boat fishery	2,088
Total area of Newfoundland boat fishery	6,204
Area of Northern Labrador boat fishery, Cape Harrison to Mugford	5,200

Professor Hind attributes the formation of the inner banks to ancient glaciers, which once occupied the fiords along the coast. Regarding this subject he wrote as follows:

"But the glaciers of Labrador have probably left even more valuable records in the form of moraines of their early existence here than deep fiords or innumerable islands. These are the shoals or banks which lie some fifteen miles outside of the islands, and on which icebergs strand in long lines and in groups. I have styled them the inner range of banks, to distinguish them from a supposed outer range in deeper water, and where larger icebergs also sometimes take the ground. The inner banks, as far as they are known, are stated by fishermen to have twenty to forty fathoms of water on them.

"Commander Maxwell's soundings, between Cape Harrison and Gull Island, near Hopedale, and just outside of the island zone, rarely show depths greater than forty fathoms. In one instance only, in a distance of about one hundred and ten nautical miles, is a depth of fifty-nine fathoms recorded."

The character of the southernmost portion of the outer or Atlantic coast of Labrador is described as follows by Professor Hind:

"The admiralty chart portrays a very important conformation of the Labrador coast line from Saint Lewis Sound to Spotted Island. The trend between the Battle Islands south of Saint Lewis Sound and the Spotted Islands (Domino River), a distance of sixty-five miles, is due north, and, with very few exceptions, there are no islands throughout this distance off the coast; but as soon as the coast line begins to turn northwest islands are numerous, and continually increase in number as far as Cape Mugford, and even toward Cape Chudleigh. Between Capes Harrison and Mugford the island zone may be estimated as having a depth of twenty miles from the mouths of the fiords seaward. The causes of the general absence of islands south of Spotted Islands probably can be traced to the never-ceasing action of northern ice driven on the coast line, when it suddenly makes its southern bend by the influence of the rotation of the earth upon the Arctic current. This current sweeps past the Labrador with a velocity of from one and a half to two miles per hour, and a westerly pressure due to the earth's rotation estimated at about eleven inches; that is to say, the mean level of the sea, on the coast of Labrador, is about eleven inches above the level it would assume if uninfluenced by the earth's rotation. As soon as the ice-laden current reaches the Spotted Islands, it is in part relieved from this pressure by the trend of the coast from southeast to due south. Hence the current changes its course southerly and on to the land. But the effect of this sudden change in the direction of the current near the shore is to throw the icebergs on to the coast from Spotted Islands to Cape Saint Lewis, where they may be seen stranded each year in great numbers. The islands, which doubtless ever existed here, have been removed by constant attrition acting uninterruptedly for ages, and with the islands the moraines lying seaward. We may then trace the cause of the vast difference between the distribution of stranded icebergs south of Spotted Islands and northwest of them. In some cases they are stranded on and near the coast line, wearing it away and deepening the water near it, assisted by the undertow; in other cases they are stranded some fifteen miles away from the island fringe, and are continually adding to the banks the *débris* they may bring in the form of mud streaks from the glacier which gave them birth in the far north and northeast.

"It is more than probable that this distribution of icebergs has a very important bearing upon the food and feeding grounds of the cod, which justifies me for referring here in so much detail to the action of glacial ice."

The following additional accounts of the Northern Labrador fishing-grounds, their faunæ, etc., are also extracted from the report of Professor Hind :

RELATION OF THE CODFISH TO STRANDED ICEBERGS.—“Upon what forms of life do the codfish feed on the Northern Labrador coast, where the summers are so short, the capelin, the herring, the squid, and even lance comparatively scarce, and where icebergs continually abound? The answer may be expressed in one word—crustaceans. These are infinite in number, from the minute sea lice of the fishermen to a large crustacean resembling a prawn. Crabs, too, are very numerous, as well as mollusks. Although the capelin ceases to appear on the coast in large shoals above the latitude of Nain, the herring is not numerous beyond Wkkasiksalik, the squid is not found beyond Domino River, and the lance is the only known Southern Labrador fish which visits the northern coast in great numbers, yet crabs, prawns, and ‘herring bait,’ with medusæ, occur in vast numbers, and form, with mollusks, the chief food of the cod. The officer in charge of the Hudson’s Bay Company’s post of Wkkasiksalik informed me that at the more remote northern Hudson’s Bay post, if seals were left in the fall of the year for a single night in the nets, the head was sure to be cleaned to the bone by the prawns. He also stated that in the northern water, opposite Hebron, Lampson, and Mactiwack, the cod feed on a small fish bearing a great resemblance to the ordinary tommy cod, but the crustaceans were their chief food. The connection existing between ice and the food of the cod is not apparent at the first glance, but when it is borne in mind that infusorial forms abound in sea water in the immediate vicinity of Arctic ice, and that on these minute creatures larger forms of life find sustenance, which again become the food of crustaceans and different species of fish upon which the cod are nourished, the chain is complete, and the relation of stranded icebergs to fish life on the Labrador coast becomes apparent. It has been shown by the labors of the United States Fishery Commission that the cod, which once existed to a large extent on the New England coast, has been starved out by the destruction of its food, and valuable fisheries ruined, but not beyond the power of restoration if the remedial measures suggested are faithfully carried out and sufficient time allowed. But on the Labrador, particularly the northern portion, through the unfailing advent of Arctic ice, a perennial supply of food is indirectly supplied to the cod, forbidding the idea of starvation on these coasts.

THE INNER RANGE OF BANKS.—“The foundations of the inner range of banks consist very probably, as stated, of glacial moraines. In their present state they may reasonably be assumed to be formed in great part of remodeled *débris*, brought down by the same glaciers which excavated the deep fiords. The absence of deposits of sand in the form of modern beaches on every part of the Labrador coast visited this season (except one) was very marked. The exceptional area observed lies between Sandwich Bay and Hamilton Inlet, Cape Porcupine being the center. It is protected from the northern swell of the ocean by the Indian Harbor Islands and promontory. Here larger deposits of sand are seen, covering many square miles in area. The reason why sandy beaches are not in general found on this coast, notwithstanding that enormous quantities of rock are annually ground up by the coast ice and ice pans driven on the shore, arises from the undertow carrying the sand seaward and depositing it on the shoals or banks outside of the islands. The undertow on this coast is remarkably strong, and it aids the formation and extension of the inner range of banks, and consequently of the feeding and spawning grounds of the cod to a very great degree.

“It may be advisable here to advert to a popular error, which assumes that the depth of water in which an iceberg grounds is indicated by the height of the berg above the level of the sea. It is commonly stated that while there is one-ninth above there will be eight-ninths below the sea

level. This is approximately true only with regard to the balance of a mass of the berg, not with regard to height and depth. A berg may show an elevation of one hundred feet above water and yet its depth below may not exceed double that amount; but its volume or mass will be about eight times the mass over the surface. Hence, while icebergs ground in thirty and forty fathoms of water they may expose a front of one hundred feet or three hundred and fifty feet, the broad massive base supporting a mass about one-ninth of its volume above the sea level."

As to the movements of cod, Professor Hind frames the following table:

Table showing the approximate mean date of arrival of cod, mean date of departure, and mean length of the fishing season for cod in Northeastern Newfoundland, Southern and Northern Labrador.

NEWFOUNDLAND.

[Over 4 degrees of latitude. Mean length of fishing season, 143 days.]

Lati- tude.	Locality.	Mean date of arrival.	Mean date of close of fishery.
47 30	Conception Bay	June 1	Nov. 20
48 20	Bonavista Bay	June 10	Nov. 10
48 30	Notre Dame Bay	June 20	Nov. 10
50 00	Cape Saint John to Partridge Point	June 20	Nov. 1
49 30	White Bay	June 10	Nov. 1
51 00	Cape Rouge Harbor	June 10	Nov. 1
51 30	Cape Bauld to Cape Onion	June 20	Oct. 20

SOUTHERN LABRADOR (ATLANTIC COAST).

[Over 3 degrees of latitude. Mean length of fishing season, 87 days.]

52 00	Chateau Bay	June 20	Oct. 1
	Batteaux	July 12	Oct. 1
54 30	Indian Harbor	July 15	Oct. 1
54 54	Cape Harrison	July 18	Oct. 1

NORTHERN LABRADOR.

[Over 3½ degrees of latitude. Mean length of fishing season, 52 days.]

55 09	Aillik	July 20	Oct. 1
55 12	Kypokok	July 20	Oct. 1
55 27	Hopedale	July 20	Oct. 1
53 30	Double Island Harbor	July 22	Oct. 1
56 00	Wkkasiksalik	July 28	Oct. 1
56 30	Nain	July 28	Oct. 1
57 30	Okak	July 28	Oct. 1
58 30	Hebron	Aug. 15	Sept. 25
58 48	Lampson	Aug. 15	Sept. 25

From this table the following law is deduced:

"Over an area extending northerly from Conception Bay for seven hundred miles the cod approach the shore about one week later for every degree of latitude we advance to the north. These tables show also that for a period of about forty days the codfishing goes on simultaneously during August and September, throughout the length of a coast line extending from latitude 47° to latitude 58° 30' in one continuous line, or more than seven hundred statute miles; hence it appears that the migrations of the shoals of this fish are merely from deep-water winter fishing-grounds to the nearest coast spawning-grounds, and from the coast to the nearest deep-

water feeding-grounds again. The coast migrations during the summer months appear to be of equally limited extent, and shoals of cod frequenting any particular coast may be said to be indigenous to it. On the Labrador, and especially in such known deep bays as Hamilton Inlet, the coast movements of the fish appear to be very regular, and determined to a large degree by the tidal currents. The capelin generally precede the cod by a few days, and these fish are known to approach the coast and enter the sandy coves for the purpose of spawning. The same law which guides the movement of the cod affects also the spawning of the capelin. I saw numerous shoals of this fish spawning in Trinity on the 27th of June. A month later they spawn in Kypokok Bay, and still later further to the north."

PRESENT STATUS OF THE NORTHERN LABRADOR FISHERY.—"About four hundred fishing craft, from eighteen to ninety tons burden, are supposed to have passed Cape Harrison this season (1876). Taking the average of the entire fleet, they carried each eight men, three fishing-boats and one shore boat. Out of the thirty-two hundred hands we may assume that twenty-four hundred were actually engaged in fishing. The estimated catch was sixty quintals per man, or in the aggregate one hundred and forty-four thousand quintals. This work was accomplished in an average aggregate of twenty-four fishing days, and to a large extent with the jigger, that is, without the use of bait. The average weight of the fish is about three pounds fresh. Allowing one hundred and thirty fish to the quintal, the number taken would be about eighteen millions; the number wounded and lost about four million five hundred thousand, although some fishermen consider that one fish out of three is wounded by the jigger and lost when the fish are very numerous."

We have quoted this report of the Labrador fishing-banks so much in detail mainly for its many valuable suggestions bearing upon several of the more southern fishing regions, which have not yet been so carefully studied. It is not probable, however, that American vessels will resort to these distant grounds for some time to come, or until forced to do so by the scarcity of cod in regions nearer home. The size of the Labrador cod is also below the standard recognized in United States markets.

Herring occur at various points along the coasts of Labrador, between the Straits of Belle Isle and Cape Harrison, and are principally taken in the vicinity of the bays and harbors resorted to by the vessels engaged in the cod fisheries of that region. This fishery is in season during the summer, but has at no time been very extensive.

3. THE EASTERN AND SOUTHERN COASTS OF NEWFOUNDLAND.

THE EASTERN COAST.

The eastern coast of Newfoundland furnishes a vast area of boat fishing-ground for cod, extending from Cape Race to the Straits of Belle Isle. Along the same side of the island, squid, capelin, and herring abound to a greater or less extent, and are taken for use as bait principally. There are no fishing-banks off this coast excepting at the southeast corner, just off which the Grand Banks are located. According to Prof. Henry Y. Hind, the extent of the shore codfishing-grounds on the eastern side of this island is as follows:

[In geographical square miles.]

Cape Race to Cape Bonavista, 294 miles, 3 miles deep	882
Cape Bonavista to Cape Saint John, 225 miles, 3 miles deep	675
Among the islands in Bonavista Bay and Bay of Notre Dame, 120 miles, 7 miles deep	840
Cape Saint John to Cape Bauld, French shore, 300 miles, 3 miles deep	900
Total	3,297

The first three estimates given in the above table are exactly as Professor Hind states them ; but the fourth estimate has been extracted from his enumeration of the entire French shore, Cape Saint John to Cape Ray, via Cape Bauld, which lies at the outer entrance to the Straits of Belle Isle, on the Newfoundland side. The table given in his report on this region includes the entire French shore in a single item. According to the same authority, the length of the fishing season along the different portions of this coast and the mean date of arrival and departure of the cod for the same are as follows :

Table showing the approximate mean date of arrival of cod, mean date of departure, and mean length of the fishing season for cod on the eastern side of Newfoundland.

Lati- tude.	Locality.	Mean date of arrival.	Mean date of close of fishing.	Mean length of fishing season.
° ' "				
47 30	Conception Bay	June 1	Nov. 20	} 143 days.
48 20	Bonavista Bay	June 10	Nov. 10	
48 30	Notre Dame Bay	June 20	Nov. 10	
50 00	Cape Saint John to Partridge Point	June 20	Nov. 1	
49 30	White Bay	June 10	Nov. 1	
51 00	Cape Rogue Harbor	June 10	Nov. 1	
51 30	Cape Bauld to Cape Onion	June 20	Oct. 20	

With reference to the construction of this table Professor Hind says: "In framing these tables I have been careful to eliminate extreme seasons, for the cod have been known to approach the shore during an exceptionally early season a fortnight or three weeks sooner than during the average of years. Although squid are abundant along the entire eastern coast, they are principally taken as bait to sell to the United States bank fishermen, toward the southeastern extremity of the island, in Conception, Trinity, and Bonavista Bays. Within the past few years this region has also been resorted to by a few American vessels, who obtain cargoes of squid, principally by purchase, to sell to the French fishermen at Saint Pierre. This traffic has also been participated in to some extent by the provincials, and small steamers have occasionally been employed to collect cargoes at Conception and Trinity Bays, and, perhaps, farther north. Capelin also abound between Saint Johns and Cape Race, and are taken by the natives for the same purpose as the squid. The principal localities furnishing this bait are Saint John's, Broyle Harbor, and Bay of Bulls. The United States fishermen visit this coast only to obtain bait."

Notwithstanding the privileges granted by the Washington treaty, and the award made by the Halifax Commission in payment for the right to fish in these, as well as in the other, provincial coast waters, United States fishermen have been frequently interfered with in the matter of fishing for bait along the southeastern shores of Newfoundland, and the natives have even gone so far as to refuse to sell bait to them, while at the same time they have threatened armed resistance to any persons who should attempt to fish for bait in waters adjacent to the shores. This direct violation of existing treaties has often resulted in the loss of much time to the fishermen, who have been obliged to go elsewhere in search of bait.

THE SOUTHERN COAST.

The fisheries carried on on the southern coast of Newfoundland are for cod, herring, capelin, and squid, and to some extent also for halibut. Herring are taken by the natives to supply the winter trade in frozen fish and to sell to the bank fishermen as bait, and for the latter purpose capelin are also taken in large numbers. The shore fishing-grounds for cod extend along the entire

southern coast of Newfoundland from Cape Race to Cape Ray. Fishing is mostly done from small, open boats, but also, to some extent, by vessels which go as far out as five to ten miles from shore, where the water is of a suitable depth. They seldom fish, however, in deeper water than from fifty to seventy-five fathoms. The fishing-grounds are so continuous that the natives can generally obtain fair fishing without going far from home. The fishing season for cod is from April to October. When in pursuit of capelin and squid, the cod approach so near the shore that they can often be taken in seines and in traps, which do not in many cases extend more than fifty fathoms from shore. The latter mode of fishing has been introduced since 1878, and has been more efficient than the former methods of using seines and lines. The boat fishermen depend principally on hand-lines and trawls, but in the spring, when bait cannot be obtained, they often use a jigger, which is also employed on other parts of the coast.

Off Pass Island, there is a small tract in about one hundred and sixty fathoms, not over five to eight square miles in extent, where halibut were found in considerable abundance for two or three years, from 1870 to 1873. During those years a considerable number of United States vessels resorted to this region, but the grounds soon became exhausted, and little or no fishing has been done since. More recently halibut have been taken off Burgeo Island. The best halibut fishing near this coast has been obtained about thirty miles from the main-land, longitude 58° west and latitude $47^{\circ} 8'$ to $47^{\circ} 10'$ north, over an area about ten or twelve miles square, in depths of one hundred and forty to two hundred and fifty fathoms. This region is now much resorted to for a short period in the spring and sometimes even in winter. Famous halibut grounds once existed off the beach between the larger and smaller Miquelon Islands, in four to eight fathoms, and also in the channel between Saint Pierre and Miquelon. The presence of the halibut there was due to their following the capelin to the shore. The capelin usually remain about a month, and the halibut seldom stay longer, if as long. Halibut are rarely taken now at Miquelon beach in large numbers. Fortune Bay has been the great resort for vessels engaged in the frozen-herring trade since 1865, but this trade is not so extensive now with Newfoundland as it has been in former years, having been largely transferred to New Brunswick. The many long and deep arms of the sea which indent the southern coast of Newfoundland are frequented by immense schools of herring during the winter and spring months. Cargoes can frequently be taken at numerous points along this shore, but, as above stated, Fortune Bay constitutes the principal fishing-ground. This bay is sixty-five miles long and thirty-five miles wide at the mouth, but it gradually narrows toward the center, where it varies in width from ten to twenty miles. The southern coast, although quite rugged and bold, is less so than the northern, and has several sloping shores with sand beaches. The northern coast is cut into by numerous deep and narrow bays or fiords, which are favorite spawning grounds of the herring. Long Bay, the principal fishing point, is usually covered with ice in the winter through much of its extent, but the lower portion remains open and permits of the seining and netting of fish. Among other harbors formerly and now resorted to are Saint Jacques, Bay the North, and Rencontre. The numerous deep coves and harbors on the north side of Fortune Bay, as well as the sandy shores of the south side, afford seining grounds for herring during the spring and early summer. Many herring from these places are sold in the spring to the United States bankers and to the French fishing fleet at Saint Pierre. The capelin are caught with seines on the beaches of Fortune and Placentia Bays, and taken in small vessels to Saint Pierre by the Newfoundlanders, who sell them there fresh to the French. They come in June and remain from four to six weeks. The fishing is done entirely by natives, as in the case of herring, and the catch is sold to the same fishing fleets. As a rule, the French salt

both their herring and capelin bait, but the Americans preserve theirs in ice. The herring remain on this coast more or less through the capelin season and generally all summer; but while the latter fish are on the herring fisheries of Fortune and Placentia Bays are more or less neglected, many of the fishermen of those regions limiting themselves chiefly to supplying the French fishermen with capelin.

The American vessels generally obtain their supplies of capelin north of Cape Race, where the method of capture and preservation is the same as at the south. Placentia Bay is resorted to by American vessels for both herring and capelin bait, but is visited for this purpose much less than Fortune Bay and other localities. Squid are taken for bait in Placentia Bay and other places along the south coast, but, as a rule, the American vessels obtain their squid bait from the bays and harbors on the east side of the island. A species of turbot was formerly taken in considerable numbers in Fortune Bay and vicinity during the winter season from 1855 to 1875. They were generally frozen and sold to the captains of American vessels, who in turn sold them at New York and Boston. Since the decline of the frozen-herring trade in this region, comparatively few American vessels visit it in the winter season, and the turbot industry has ceased, for a time at least, although the fish are probably as abundant now as at any previous time.

4. THE GULF OF SAINT LAWRENCE.

GENERAL ACCOUNT.—Fully one-half of the area of the Gulf of Saint Lawrence, including the bays and channels leading into it, has a depth of water less than sixty fathoms. This shallow portion, which borders the northern and eastern shores of the Gulf to a distance of from six to ten miles from land, but which comprises all the southwestern third at least, forms a more or less continuous fishing-ground of great value and importance. Of late years, as the fisheries of the outer banks and the Gulf of Maine have been more and more developed, United States vessels have resorted to the Gulf of Saint Lawrence much less than in times past, and we are now rapidly becoming independent of this once much coveted fishing-ground.

The western coast fishing-grounds of Newfoundland, from Cape Bauld to Cape Ray, according to Prof. H. Y. Hind, constitute a boat-fishing area for cod nearly four hundred miles long by about three miles deep. The rights of this fishery belong to the French by treaty, a privilege also enjoyed throughout most of its extent by citizens of the United States. A similar fishing-ground, though of less importance, borders the northern coast of the gulf and the island of Anticosti. Places worthy of note along this shore are the Natashquan cod-bank and the Mingan Islands. This group of very small islands lies between the western end of Anticosti and the north shore, and between the meridians of 63° and 64° west longitude. About sixteen islets, the largest not over five miles long, with a number of small rocky spots, are marked out on the admiralty chart as composing the Mingan Islands. Their distance from land varies from two to seven miles, the depth of water among and about them varying from four to forty-seven fathoms. They are scattered irregularly, the bottom between them consisting of sand, gravel, rocks, and shells.

The southwestern portion of the Gulf furnishes by far the most extensive and important fishing-grounds. The area within the limits of the sixty-fathom line reaches about one hundred and eighty miles eastward from the coast of New Brunswick and about one hundred and forty miles northward of Nova Scotia, and includes the well-known Magdalen Islands and Bradelle Bank.

There is great uniformity in the depth of water and the character of the bottom nearly everywhere, the bottom being generally rocky and diversified with areas of greater or less extent of sand, gravel, or mud.

ORPHAN BANK, which lies thirty-five miles a little north of east of Miscou Island, at the mouth of Chaleur Bay, is of very limited extent. The shallowest sounding upon it, as indicated on the admiralty chart, is twenty-five fathoms, and this appears in only one spot, while about it and within a radius of eight miles are marked from thirty-five to fifty-three fathoms. The character of the bank and its fauna are thus described by Mr. J. G. F. Whiteaves:

"The Orphan Bank, which is situated off the entrance to the Bay des Chaleurs, is a stony patch, as are most of the inshore fishing-banks, many of which are not indicated or defined on the charts. The masses of rock are usually large pieces of reddish sandstone (often perforated by two species of boring bivalves, the *Saxicava rugosa* and *Zirphæa crispata*), with a small proportion of pieces of Laurentian gneiss, etc. Animal life is profusely abundant here, which is undoubtedly the reason why cod, mackerel, etc., frequent this and similar banks in such enormous numbers. Soft-bodied organisms of various kinds give a special facies to this particular one. These are incrusting sponges; tunicates of many genera and species, some of unusual size; an *Actinia* (*Metridium*); the common northern *Alcyonium* (*rubiforme*); *Alcyonidium gelatinosum*; Hydrozoa and Polyzoa, in great profusion, etc. Among the harder forms are an abundance of the commoner Echinoderms, with a few scarce species; large calcareous Polyzoa, and a large number of fine Crustacea. Shells are tolerably numerous, though not nearly so much so as on the Bradelle Bank, and Annelids were relatively scarce."

The character of the bottom on "Miscou Flat" and about the Magdalen is very similar to that of Orphan Bank, while it is probable that the Pigeon Hill Ground more nearly resembles Bradelle Bank.

BRADELLE BANK.—The Bradelle Bank is of much greater extent than the Orphan Bank. Its center lies about fifty miles west by north of Grindstone Island, Magdalen Islands, and, as laid down on the charts, it covers an area of about thirty miles long from north to south, by about twenty miles broad from east to west. The deepest sounding near the edge is about thirty fathoms and the shallowest twenty fathoms; the soundings mostly range from twenty-one to twenty-five fathoms. The distance from the center of Bradelle Bank to Orphan Bank is about forty miles, the greatest depth between being fifty fathoms. The greatest depth between Bradelle Bank and the Magdalen Islands is from thirty-six to forty-two fathoms. The bottom and faunal characters of Bradelle Bank are described by Mr. Whiteaves as follows:

"The Bradelle Bank is also a stony patch, but the pieces of rock are usually small, and there is a greater admixture of gravel, sand, and mud on this bank than upon the Orphan. Soft-bodied animals appear to be scarce upon the former, and shells occur in unusual abundance. The assemblage of Hydrozoa, Echinoderms, Polyzoa, and Crustacea is much the same on both banks, though a few peculiar species were found on each. The rarer forms found at these two places will be catalogued in the second part of this report. While the animal life of the shores of Cape Breton (except in deep water), of those of the Magdalen group and of Prince Edward's Island, as well as that of the whole of Northumberland Strait up to the southern entrance to the Baie des Chaleurs, is of an Acadian or Southern type, the fauna of the Orphan and Bradelle Banks has a decidedly Arctic or Northern character. The Bradelle Bank, in particular, presents the phenomenon of a small patch tenanted by an assemblage of marine animals which usually inhabit very cold water, and almost entirely surrounded by another series, which are for the most part prevalent where the bottom is warmer and more affected by surface conditions of temperature."

MISCOU FLAT is a stretch of rocky shoal ground that makes out from Point Miscou in an east-southeast direction a distance of nearly twenty miles. There is depths of water upon it of ten to twenty-two fathoms, the bottom gradually falling off to the outer part.

PIGEON-HILL COD GROUND consists of the shore soundings (four to seventeen fathoms) that lie from ten to twenty miles southeasterly from Shippegan Island, New Brunswick, and extends southward along the coast about eighteen to twenty miles.

Codfishing is pursued on all of these grounds—Bradelle Bank, Orphan Bank, Miscou Flat, and Pigeon-Hill Ground—only during the warm seasons of the year (May to October).

The abundance of cod, especially of large fish, varies somewhat with the different seasons, their presence in greater or less numbers being governed to a large extent by the amount of food (herring, mackerel, etc.) on the ground. Miscou Flat and Orphan Bank are noted for large codfish. There are sometimes what appear to be two schools of codfish at the same time on these banks, one of which is caught in the day-time and the other only at night. The first is of small size, but the second is extraordinarily large, being larger than are found at any other locality.

The fishing is mostly carried on by residents of the vicinity in small boats, although some Nova Scotia vessels and a limited number from the United States sometimes engage in it.

MAGDALEN ISLANDS.—The Magdalen Islands, which lie about fifty to sixty miles northwest of Cape Saint Lawrence, Cape Breton Island, form an elongate chain trending in a northeast and southwest direction. The total length of the chain with its outlying rocks is in the neighborhood of fifty to fifty-five miles.

The main group consists of five or six small islands, separated by narrow channels varying in width from a few rods to half a mile. Its greatest length is thirty-six miles and its greatest breadth about five or six miles. The shores of these islands are quite irregular, being very bold and rocky in some portions and in others formed of stretches of sand.

The entire group lies toward the eastern edge of the sixty-fathom limit, but is wholly included within it. The surrounding area, within a distance of five or seven miles of the islands, ranges in depth from four to eighteen fathoms, and contains many small scattered rocky spots or reefs reaching to near the surface of the water. The bottom, as indicated on the charts, is made up of sand, shells, stones, and rocks. A reddish sandstone predominates in the shoal water about the islands. Between the shallower soundings of the islands and Cape Breton Island the depth ranges from twenty-four to seventy-five fathoms, the deepest water extending close along the Cape Breton Island coast. Formerly, when hand-lines alone were used, codfishing was carried on to a considerable extent around the entire group of islands; but since the introduction of trawls United States fishermen have found it more profitable to resort elsewhere. The so-called "sharp bottom" of the region, due to the many rocks and stones scattered about, unsuits it for trawl fishing. Now the codfishing is almost wholly carried on in the open boats of the resident fishermen and by the small vessels belonging to the British Provinces and the French Islands of Saint Pierre and Miquelon. A few catches of halibut have been taken on the shoals about Byron Island, but the appearance of these fish in that locality is so uncertain that the halibut catchers rarely go there.

CAPE NORTH FISHING-GROUND.—Around the northern end of Cape Breton Island is located a codfishing-ground which is of considerable importance for a few weeks in the spring and early summer. It lies between Cape North and Saint Paul's Island, at a distance of four to fifteen miles from land; thence it extends westerly about fifteen miles, and southwesterly, along the coast of Cape Breton Island, as far as Limbo Cove. The shore here is high and steep, so that, notwithstanding the close proximity of the fishing-ground, the depth of water upon the latter is from sixty-five to one hundred fathoms. The bottom is mostly tough clay, but ten to fifteen miles from land some rocky ridges exist. The current sets out from the Gulf of Saint Lawrence toward the southeast, over a portion of the ground, although the direction changes more or less with the trend of the shore.

Strong westerly winds increase the strength of the current, which after a long continuation of them sometimes runs at the rate of two to three miles an hour. As a rule, however, the tides run slowly. Fishing is often hindered by floating field ice, which sometimes prevents the vessels from reaching the grounds until late in the season. About 1860 and 1861, cod and halibut were found abundantly on these grounds; but later the halibut almost wholly disappeared, and for several years they have been taken only occasionally. Cod are still quite plentiful in May and June, at which time they are moving slowly in by the head-land, on their way to the shoaler grounds of the Bay of Saint Lawrence.

This fishing-ground is resorted to by both provincial and United States vessels, but, owing to the difficulties alluded to above, the fleet is usually small.

COD AND HALIBUT GROUNDS.—Vessels from the United States used to frequent the Gulf of Saint Lawrence both for cod and halibut, but mainly for the former species, until the trips became unprofitable from the scarcity and small size of the fish obtained, and until the introduction of trawls, with which better results could be obtained on the outer fishing-banks. Vessels on their way to Northern Labrador would sometimes harbor along the shores of the Straits of Belle Isle, and fish from small boats to make up a portion of their catch. Several attempts were also made for cod by Gloucester vessels on the Natashquan cod-banks, Southern Labrador, but the trips never paid, and the grounds have since been neglected.

From 1863 to about 1875, Gloucester vessels resorted to the southern coast of Labrador, between the parallels of 60° and 66° west longitude, and the coast of Anticosti in search of halibut. These fish approach quite close to the shores in pursuit of capelin or other small fish, and were caught in considerable numbers within two or three miles of the coast, in five to twelve fathoms of water. As a rule, the halibut were of medium size and fine quality, but they were not nearly so plentiful as in the more recently worked "deep water" of the outer banks. The principal disadvantage of carrying on this fishery was that the bait (herring) had to be obtained in the southern part of the Gulf, and would often become old and unfit for use before a school of halibut could be found, as it sometimes happened that a long stretch of shore would have to be skirted in search of the fish; the distance from market was great, and head winds were usually encountered on the passage, at least as far as Canso, and, finally, the fish decreased so much in numbers that the trips would no longer pay. Vessels have visited this region within three years, but none of them have secured good catches. The halibut grounds of Anticosti were mainly on the northern side of the island, with the same depths of water as on the Labrador coast.

The western coast of Newfoundland likewise furnished cod and halibut grounds in former years for United States vessels, but they have also been nearly deserted for the outer banks. The principal localities where halibut were taken were Saint George's Bay, Red Island, Port au Port Bay, Bay of Islands, and Green Point; but no important catches have been made in any of these places excepting Green Point for a number of years. Green Point was given up at the same time as the others, but fishing began there again in 1878, and more or less fish have been taken nearly every year since. At Red Island, a French fishing station, foreign vessels are not permitted to fish, but in a few instances the Gloucester vessels were allowed to carry away all the halibut they could secure by giving over to the French fishermen whatever cod were taken on their hooks. This practice has since been abandoned, however, and United States vessels have never resorted extensively to this region for cod. Several trials for cod were made in the winter of 1861 and 1862, but such small fares were obtained as to discourage the fishermen. Similar attempts have been occasionally made since then, but always with the same results, due perhaps more to the severity of the weather than to the scarcity of fish. It should be remembered, however, that all these attempts were made in

winter, while the provincials and French fish here for cod only in the summer. Much better cod grounds, however, lie nearer the coasts of the States.

MACKEREL GROUNDS.—No positive rules can be laid down as to the appearance of mackerel on the several grounds of the Gulf of Saint Lawrence. Formerly, when these grounds were largely resorted to by vessels from New England, the fishing was principally carried on in the early part of the season (June and July) north of Prince Edward's Island and between there and Cape Gaspé. This section embraced the "West Shore" from Escuminac to Point Miscon, the Bay of Chaleur, Bradelle Bank, Orphan Bank, and the adjacent waters. Later in the season, August and September, the vessels generally visited the waters along the north side of Prince Edward's Island and about the Magdalen Islands. During some years, however, the fishing was continued on the first-mentioned ground throughout the entire summer. As the season advanced, mackerel were generally found in the greatest abundance in the extreme southern parts of the Gulf, especially about the eastern point of Prince Edward's Island, the north side of Cape Breton Island, in Saint George's Bay, and also about the Magdalen Islands. The principal points where good catches were usually obtained on the coast of Cape Breton were in the vicinity of Sea Wolf Island and Cheticamp Island. These places were generally the last visited in the fall. As a rule, when the mackerel were found here at all they occurred in great abundance; but when the schools left this region they were rarely seen again the same season. Mackerel have also been taken in great numbers along the east coast of Cape Breton Island, between the entrance to Great Bras d'Or Lake and Flint Island, and good catches have been obtained there from July until late in October. Their appearance in this region has not always been regular, however, and a season of great abundance is often followed by one of extreme scarcity.

Although the movements of mackerel in the Gulf of Saint Lawrence during the summer and fall months are about as has been described above, they are subject to certain variations at different periods, and it occasionally happens that good fares are obtained about the north shore of Prince Edward's Island early in the season. Again, this locality may furnish the best fishing during August and September one year, and the next year mackerel may be scarce there though very abundant in other portions of the Gulf. The appearance of large bodies of mackerel in the different localities is doubtless much influenced by the abundance of food, the direction and strength of the prevailing winds, and by other causes not so well understood.

In exceptional instances, fares of mackerel have been obtained at the Seven Islands, and Mingan Islands, on the southern coast of Labrador, and also at the mouth of the Saint Lawrence River, from Cape Chatte to Cape Gaspé. On one occasion, at least, a fare was also obtained at Port au Port, on the west coast of Newfoundland. These catches, with the exception of the last named, were obtained chiefly by the crews in boats, either with hooks and lines or with seines, while the vessels lay at anchor in the harbors.

The vessels visiting the northern fishing-grounds were usually provided with a number of dories, and, after the schooners were securely moored, the men would start out at daylight in the boats, trying for mackerel in the coves and along the shores where the vessels could not be taken. As the mackerel were secured they were carried on board the schooners, dressed and salted.

The fishing grounds of the Gulf of Saint Lawrence, though a favorite resort for mackerel catchers when this fishery was carried on exclusively with hook and line, are not well adapted to the use of purse-seines, which are the principal apparatus now employed in the capture of mackerel. The localities to which they usually resort are too shallow for purse-seines, and, again, the mackerel appear less frequently at the surface in the Gulf of Saint Lawrence than off the coast of the United States, and though they may occur at the former place in large numbers,

their presence is not generally as readily detected. Another hinderance to seining in the Gulf is the greater prevalence there of stormy weather, after the month of July; than on the coast of the United States.

HERRING GROUNDS.—The principal fishing-ground for herring in the Gulf of Saint Lawrence is Pleasant Bay, situated at the southern end of the Magdalen Islands, and opening broadly toward the east. The shores of the bay are bold and rocky in some places towards the north, but are low and sandy elsewhere. Its depth varies from three to eight fathoms, the bottom being composed of white sand. The herring arrive about the last of April and continue in great numbers throughout the spawning season, entirely disappearing about the first of August.

Herring also resort to various portions of the coast of the island of Anticosti, situated in the northern portion of the Gulf, about ninety miles from the Magdalens; but the principal herring grounds are about the North Cape, the eastern extremity of the island. Fishing is at its height here during the month of June, and cod vessels failing to load at the Magdalens can reach the island in time to secure a fare. Until the past few years vessels have rarely, if ever, visited this region, as there has been an abundance of fish in more easily accessible places.

Herring visit many localities on the coast of Newfoundland, and are taken to a greater or less extent in all the bays and harbors. The principal fishing-grounds are in Fortune Bay, on the southern side, and in Bonne Bay and Bay of Islands, on the western side of the island. Bonne Bay, which is situated about midway between the Straits of Belle Isle and Cape Ray, is a small, deep-water bay, with two arms, of which the southern one is more frequented by herring, which enter in large numbers. Bay of Islands, about twenty-five miles farther south, is of larger size than the above, and constitutes a more important fishing-ground. Of its several deep-water arms, extending from fifteen to twenty miles inland, the most southern one, locally known as the "Sou'west arm," furnishes the principal fishing-ground. The fish are found in this region during the greater part of the year. They visit it in the early spring to spawn, and remain through the season to feed upon the small crustaceans, which are very abundant in these waters. These fish are mostly captured by the natives, who sell them to the provincial and United States vessels.

The herring when they arrive in the spring are quite poor, but fatten rapidly, and those caught in the fall are considered equal, if not superior, to any others taken on the American coast.

Vessels occasionally visit Bonne Bay and Bay of Islands in the spring, when they have failed to secure a catch at the Magdalens. The principal season, however, is during the fall, the vessels generally arriving in October and leaving before the last of December. They frequently leave earlier than this to prevent being frozen in by the ice, but a number of vessels have been detained by this cause nearly all winter.

A school of herring enters Saint George's Bay, between Nova Scotia and Cape Breton Island, in June, and remains there one or two weeks, during which time the fish are usually very abundant. At this season, the locality is visited by the United States bank fishermen in search of bait. The principal points where herring are taken on the gulf side of Cape Breton Island and Nova Scotia to sell as bait to the bank fishermen are Port Hood, the Judique shore, and Havre Bouche or Knight Inlet.

TIDAL CURRENTS.—Prof. H. Y. Hind, in his account¹ of "the relation of the movements of mackerel in the Gulf of Saint Lawrence to tidal currents," describes those currents as follows:

"There is, perhaps, no part of the world where the tidal waves and resulting currents are distributed in such a remarkable manner as in the Gulf and estuary of the Saint Lawrence.

¹ The Effect of Fishery Clauses of the Treaty of Washington, etc. Halifax, 1877.

"The meeting and overlapping of tidal waves of different ages, that is to say, the tide of to-day meeting the tide of twelve hours ago, and producing a double overlapping tide, is of rare occurrence, and is due to the configuration of the sea bottom conjointly with the relative position of islands and neighboring coast lines.

"Northumberland Straits and the north shore of Prince Edward's Island afford the most remarkable instances on the American continent of the meeting of tides of different ages, and it can scarcely be doubted that the long and continuous line of inshore eddies, produced in a large measure by this singular confluence, conjointly with the low temperature resulting from the mixing of cold underlying with warm surface sea-strata, is the chief cause why mackerel fishing-grounds should be there so close inshore with such undeviating constancy.

"*a. The Prince Edward's Island double tide.*—The tidal wave, entering the Gulf of Saint Lawrence between Cape Breton and Newfoundland, rushes with great rapidity along the edge of the bank forming the boundary of the sixty-fathom line of soundings. It sends off lateral waves toward the Straits of Belle Isle and toward Prince Edward's Island, while the main wave, following the deep water at the edge of the sixty-fathom line of soundings, pursues a rapid course toward and up the Lawrence estuary, and reaches Cape Chatte and Point de Monts precisely at noon on the days of full and change of the moon.

"Regarding for the present the lateral wave which strikes off toward the southwestern portion of the Gulf, we find it split into two portions by the Magdalen Islands; one-half, namely, the eastern part, sweeps past the shores of Cape Breton and reaches the east point of Prince Edward's Island at eight hours thirty minutes, Cape Bear at nine hours, and the middle of the straits opposite Hillsborough Bay at ten hours. Here it meets a flood tidal wave coming down Northumberland Strait from the northwest, but this wave is not the other half of the wave which was split by the Magdalen Islands two hours before; it is the tidal wave twelve hours old, which has been delayed in its detour round the north part of the Magdalens and over the shallows of the Bradelle and Orphan Banks. A line drawn through the Magdalen Islands, Roche's Point, and the mouth of Hillsborough River, in Prince Edward's Island, and Wallace Harbor, in Nova Scotia, will pass through the places where the overlapping of the confluent tidal waves takes place, at the full and change of the moon, near the shores of Prince Edward's Island. . . .

"Admiral Bayfield is of opinion that these waves of different ages, one being twelve hours younger than the other, meet on the north side of the great bight of Prince Edward's Island, between Tracadie Harbor and Savage Harbor. On the Admiralty charts this locality is designated by the words "Tides Meet." The current is inshore toward this point, both from North Point and East Point, and the effect of the indraft is to determine toward the coast line the floating or free-swimming food of the herring and the mackerel. The great bight formed by the concave northern coast line of Prince Edward's Island is the result of ages of action on the part of these confluent tidal waves dragging along the sloping beaches, and washing away the resulting *débris* from the sandstone rocks, of which a large part of this coast line is composed. The ceaseless operation of these forces is thus manifested in the wearing away of the shores most subject to their influences.

"*b. The eddy flood tide in the estuary of the Saint Lawrence.*—According to Admiral Bayfield, the flood tide in the estuary of the Saint Lawrence, beginning at Anticosti and proceeding some miles above Bic, rushes up the broad midchannel as far as Red Islet and Green Island, where part of it, being obstructed by the islands, turns round and, as an eddy flood tide, sweeps along

and down the southern coast as far as Gaspé Basin, only a thin and narrow band of flood tide running upward between the eddy flood and the coast line.

“On the days of full and change of the moon it is high water at noon both at Point de Monts and Cape Chatte, and high water later and later down the coast, so that at Cape Rozier it is one hour thirty minutes before it is high tide there.

“In other words, the flood tide rushing up the deep midchannel between Cape Rozier and Anticosti Island passed up more than an hour and a half before the eddy flood tide returned coastwise to Cape Rozier.

“Bayfield states that there is a very narrow flood tide close inshore running westerly along the Gaspé coast inside of the eddy flood. These currents moving so constantly in opposite directions, and close inshore, tend to produce the continuous line of eddies which cause the free-swimming food of the mackerel to be found near to the land, and make that portion of the estuary a mackerel ground.

“On the north shore of the estuary, between Mingan and Point de Monts, the periods of high water at full change of the moon are altogether different. The tidal wave reaches Mingan Island at 1.30, Seven Islands at 1.40, Cawee Island at 1.50, English Point at 2, and a few miles farther on it meets the ebb tide two hours old sweeping past Point de Monts.

“The flood tide on the north shore is only about three leagues broad. The strength of the stream is greatest inshore, and beyond three leagues from the coast it becomes insensible.¹

“The eddies produced in the bays between Moisie and Point de Monts by this inshore flood tide throw in and keep the food near the coast line.

“Hence it is that the flood tide on the north shore flowing westerly and the eddy flood on the south shore flowing easterly, with a thin belt of westerly flowing flood between it and the land, produce inshore eddies, which concentrate the free-swimming food of the mackerel, hereafter described, on these coasts.

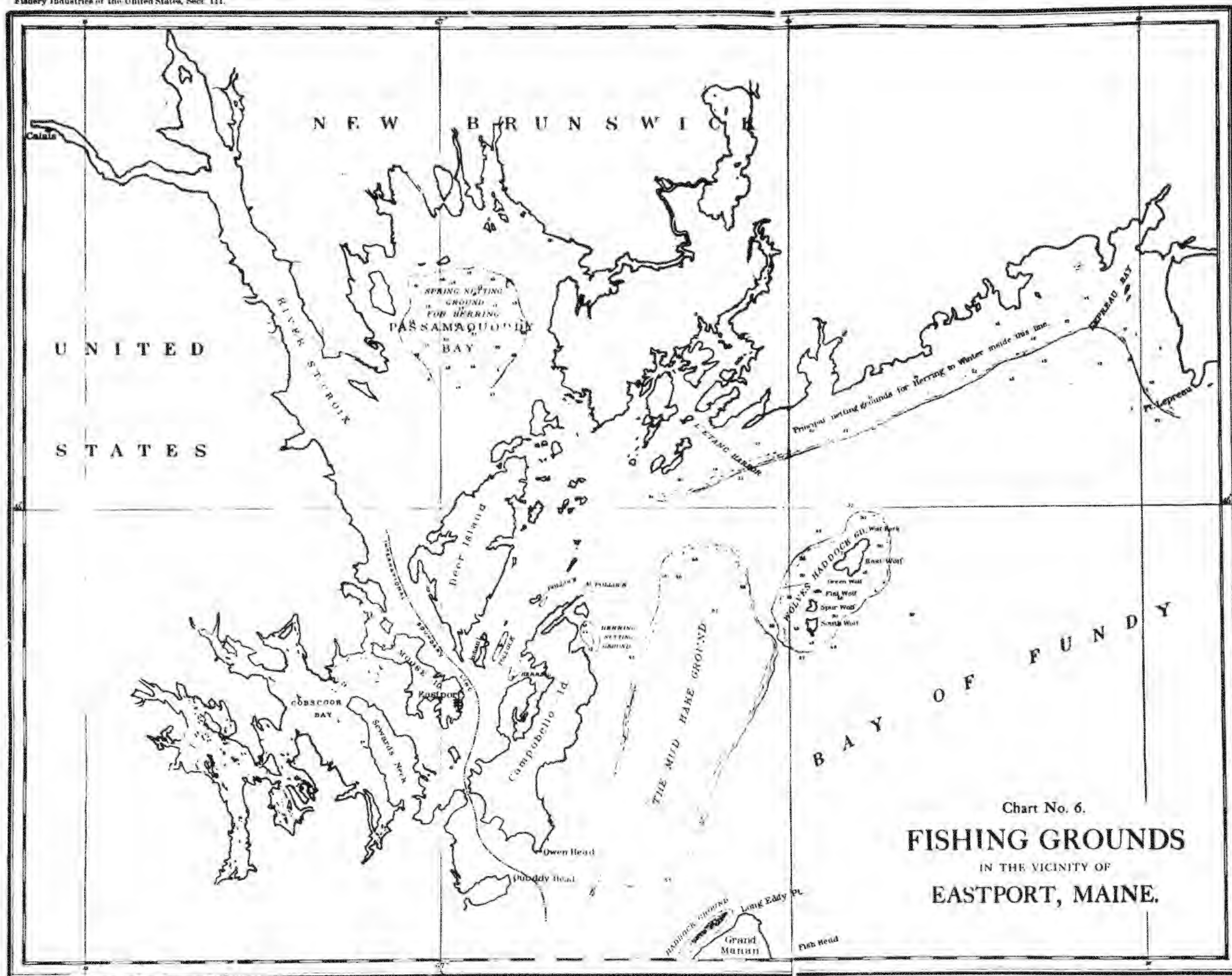
“The strength of the current in deep water off shore, on the south coast of the estuary of the Saint Lawrence, is stated to be sufficient to prevent fishing operations there, thus offering a practical difficulty, which is repeated on some parts of the northern shore during high tides.

“In the Bay of Chaleurs, where the tides are regular, the mackerel ground of the day depends upon the wind. A southerly wind converts the south side of the bay into a lee shore, and the fish are found chiefly on that side, especially toward Nepissiguit Bay. When the wind is northerly the Gaspé becomes a lee shore, and the fish are chiefly found between Bonaventure Island and Paspebiac, and on toward Cascapedia Bay. It has already been observed that mackerel and surface feeders generally swim with open mouths against the wind and tide. The cause which brings the mackerel from the south shore to the north shore arises from the fact that in the natural pursuit of their surface food against the wind they are brought up by the land, and finding food in the tidal eddies there, they pursue their course inshore against the tidal currents, until a change in the wind induces them to cross again to the opposite shore, where similar conditions prevail. On the gulf coast of Cape Breton the set of the currents is oftentimes inshore.”

5. THE OUTER COASTS OF CAPE BRETON ISLAND AND NOVA SCOTIA, INCLUDING THE BAY OF FUNDY.

OUTER COAST OF CAPE BRETON ISLAND AND NOVA SCOTIA.—Shore fishing-grounds for cod exist along the entire outer coast of this region. They are located on the so-called shore soundings, which range in depth from about ten to fifty fathoms, the average width of this coast belt being

¹ Sailing Directions for the Saint Lawrence.



about eighteen miles. Fishing is mostly carried on beyond three miles from shore, though some boats fish much farther in, and begins about the first of May and lasts until October; it is mainly in the hands of the provincials, although a few vessels from the United States resort to the region occasionally. Saint Ann's Bank is a cod-fishing ground on the shore soundings off the east end of Cape Breton Island, which is mainly fished upon by the people living on the adjacent shores.

For a number of years several American vessels were in the habit of visiting the halibut grounds in the vicinity of Flint Island and Scatari Island, Cape Breton, and a number of good fares of halibut were obtained there. The grounds were of small extent, however, and soon became exhausted. No important trips have been made to that region since 1875. Halibut have rarely been taken in large quantities on the coast of Nova Scotia.

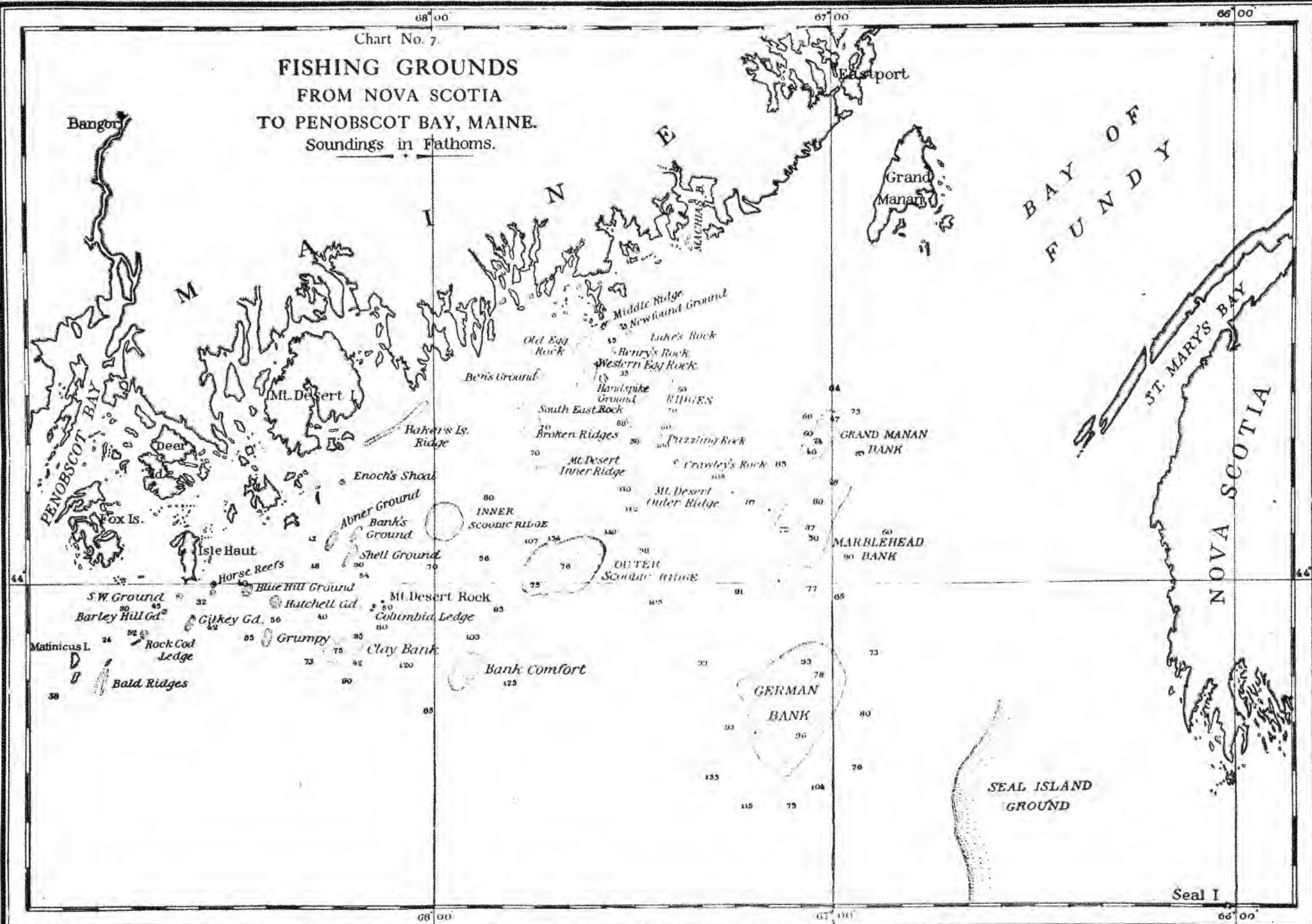
Herring are abundant at numerous points along this coast, and are mainly taken to supply the United States and provincial vessels with bait. The Peninsula of Halifax, especially about Prospect, is a great baiting station, and other similar stations occur all along shore between Cape Sable and Canso. Mackerel make their appearance about the western part of Nova Scotia in May, and follow eastward along the coast until they arrive at Cape Canso, where they turn northward, entering Chedabucto Bay and passing through the Strait of Canso into the Gulf of Saint Lawrence. They come from the south and southwest, and appear to strike the entire coast at very nearly the same time, arriving at the eastern end, however, a little later than at the western, the schools gradually working eastwardly. At the same time large quantities of mackerel pass around the east end of Cape Breton Island and thus reach the Gulf of Saint Lawrence. In the fall they return by the same route, and continue to pass up the coast until about the last of November; but some seasons they remain later and others they are earlier in their migrations toward the south. As a rule, no mackerel of any account are on this coast from the 1st of July to the 15th or 20th of September; some schools of small fish remain the entire summer. They are captured in gill-nets, seines, pounds, and traps; but during their fall migrations it is not always safe to set the nets far from land on account of the severity of the weather. The mackerel fishery of the coast of Nova Scotia and Southern Cape Breton is of slight importance compared with that of the Gulf of Saint Lawrence, as the fish remain in the first-mentioned localities for a much shorter time, and are taken only by the natives along the coast.

BAY OF FUNDY.—The only important fishery at present in the Bay of Fundy is that for herring. Mackerel occasionally enter Saint Mary's Bay and other places at the mouth of the Bay of Fundy, and from 1835 to 1850 this region was considered a famous mackerel ground. During the last thirty years, however, it has been but rarely visited by United States vessels. Fair catches of halibut were formerly obtained at the mouth of the bay, in from thirty to sixty fathoms, and even farther in than Bryer's Island, but for the past fifteen years this fishing, like that for mackerel, has not been profitable. Codfishing is carried on near the mouth of the bay, but not to any great extent, mainly because of the strong tides, which are not favorable to it. The Grand Manan Rips were formerly the most celebrated herring-grounds on the northern coast, and were much resorted to by American vessels. The fishery has, however, been gradually transferred to the coast of the main-land about the mouth of the Bay of Fundy, especially on the north side, although herring are also taken in considerable quantities in and about Saint Mary's Bay, on the southern coast. The herring approach Grand Manan in July, and remain there until the middle of September. Toward the last of October other schools arrive upon the shores of the main-land about Campobello Island, and later, during midwinter, the waters between Eastport, Maine, and Point Le Preau, New Brunswick, become crowded with them. They enter Saint Andrew's Bay and remain until late in the spring. The fishery begins to the westward, commencing first about Grand Manan and

Chart No. 7.

FISHING GROUNDS FROM NOVA SCOTIA TO PENOBSCOT BAY, MAINE.

Soundings in Fathoms.



Campobello, and continues later about Point Le Preau and in Saint Andrew's Bay. These fish are taken to supply the frozen-herring and sardine trade, and to sell to the bank fishermen as bait.

There are a few distinct grounds for hook and line fishing at the mouth of the Bay of Fundy, located and characterized as follows:

THE WOLVES HADDOCK GROUNDS.—Around the group of islands called the Wolves, which lie off the southwest coast of New Brunswick, the bottom is composed of rocks and gravel for a distance averaging about three-quarters of a mile from the shore. This narrow strip is a favorite haddock-ground, and is much resorted to by the small boat fishermen of the vicinity, and also by others from Eastport and Lubec, Maine. The depths vary from eighteen to thirty-four fathoms, and the bottom is somewhat broken and irregular.

Small haddock-grounds also exist close inshore to the westward of the northern end of Grand Manan. The outer edge lies about half a mile off shore, the length of the ground being about two miles and the depth of water from fifteen to forty fathoms.

THE MUD is a broad area of muddy bottom, forming the channel to the eastward of Campobello Island, beginning in the north to the westward of the Wolves and extending southward to between West Quoddy Head and Grand Manan. The western edge of this ground lies about two miles off Campobello, and its width averages about three and a half miles. The depths vary from thirty-nine to sixty fathoms, the bottom consisting of soft mud. This is the best ground for hake in this vicinity, and is resorted to by small vessels and open boats from Western New Brunswick and Eastern Maine.

POLLOCK GROUNDS.—Two pollock grounds occur in this vicinity, both lying to the westward of the northern part of Campobello Island. One lies just to the eastward of, and very near to, Indian Island, and is formed of strong tidal eddies. Another lies at the mouth of the channel between Campobello and Casco Bay Island, being close to the eastern shore of the latter island, and likewise is an area of strong tidal eddies. Both of these grounds are of limited extent and of less importance now than formerly, but they are still much resorted to by the small boats of the vicinity.

TEMPERATURES IN THE BAY OF FUNDY.—The following observations, made during August, 1872, by the United States Fish Commission, will serve to indicate the summer temperatures of the surface and bottom waters at the mouth of the Bay of Fundy. They are too few in number, however, and extend over too short a period, to be of much value in making comparisons with the temperatures of other regions which have been more fully worked up.

The surface temperature to the east of Grand Manan, at distances varying from two and a half to ten miles from the island, during August 23 and 24, 1872, ranged from 48° F. to 53° F.

Within the same area the bottom temperatures, taken at the same time, were as follows: Two miles from the island, depth twenty-nine fathoms, 44° F.; two and one-half miles from the island, depth twenty-eight to fifty-two fathoms, 39½° F.; eight to ten miles from the island, depth from ninety to one hundred and five fathoms, 37¾° F. to 38° F.

To the westward of Grand Manan, at distances of three to six miles from land, the surface temperatures on August 28, 1872, ranged from 47° F. to 48° F. The bottom temperatures of the same area, at depths of forty to fifty-five fathoms, varied from 40° F. to 45° F.

Just east of Campobello Island, on the fishing-ground called the "Mud," the surface temperatures from August 2 to 16, 1872, varied from 48½° F. to 57½° F. The bottom temperature at twenty-five fathoms was 47° F.; at sixty fathoms 43° F.; at eighty fathoms 39¾° F.

In Passamaquoddy Bay, between Deer Island and the coast of Maine, in depths of water ranging from thirty to seventy fathoms, the surface temperature was 48° F., and the bottom temperatures from 45° F. to 46° F.

6. THE COAST OF MAINE.

GENERAL ACCOUNT.—Within the limits of the sixty-fathom line, which lies at an average distance of twelve to fifteen miles from the coast, there occur a very large number of rocky or gravelly patches, which are the favorite resorts for cod, haddock, and pollock, while on the muddy bottoms between hake are generally found in greater or less abundance during the summer. In addition to these grounds, of which special descriptions are given on the following pages, there are many other banks, mostly of small size, situated in the bays and among the numerous islands dotting the coast line, on which the different species of the cod family can be taken. These banks, with the intervening valleys, form a more or less continuous and rich fishing-ground, bordering the entire coast of Maine. During a part of the summer, when the dogfish have driven away nearly all of the fish from the outer grounds lying off the coast, good fishing can generally be obtained near land. Herring and mackerel are also very abundant in their season along the entire coast. The former species is caught in large numbers in weirs and gill-nets, placed for their capture around the outer islands and in the numerous bays and harbors which indent the coast. From June to November immense quantities of mackerel visit the coast of Maine; they are often so abundant as to enter the bays, large schools being met with some distance inside of the coast line, as far inland, in fact, as the saltness of the water will permit. The deeper water off this coast is, however, better suited to their capture, as described elsewhere.

Lobsters are more abundant on the coast of Maine than elsewhere within the territory of the United States. In some localities they are captured throughout the year, and doubtless the season might be as continuous nearly everywhere were the demands sufficient to warrant their being taken at all times. In the summer they enter all the bays and estuaries, and some generally ascend as far as the water is sufficiently salt for them.

The soft clam (*Mya arenaria*) also abounds on the shores of the Maine coast. It is extensively used as food and as bait for cod and other fish. Large quantities are salted annually to sell as bait to the bank fleet.

On the following pages, brief descriptions are given of the principal inshore fishing-banks, the majority of which lie within the sixty-fathom line. Some of those lying just without this limit, in part or wholly, are, however, also included here, as belonging to the same series of grounds, and as being visited by the same class of fishing boats. This list, although it cannot be considered as complete, probably contains nearly all the fishing-grounds of any size that can be distinctively marked off from the general fishing area of the coast.

GROUNDS OFF MOOS-A-BEC LIGHT.

LUKE'S ROCK bears south by east from Moos-a-bee light; distance, three miles. It is nearly circular in outline, about one mile in diameter, with depths of twenty-five to thirty-five fathoms, and a bottom of rocks, gravel, and mud. Hake, cod, and pollock, together with a few haddock, are taken on this rock by the small-boat fishermen.

NEWFOUND GROUND.—This is a small rocky spot, not more than one-fourth of a mile in diameter, having in the center an automatic buoy, placed there by the Government as a guide to vessels bound to or from the Bay of Fundy. It bears south by west from Moos-a-bee light-house, from which the buoy is distant about three miles. The depth is eighteen fathoms. This ground is resorted to by a few small-boat fishermen, using hand-lines.

HENRY'S ROCK lies five miles southwest by south from Moos-a-bee light-house. It is one-fourth of a mile in diameter, with a depth of thirty fathoms, the bottom being quite level. It is resorted to by small boats, hand-lines only being used.

HANDSPIKE GROUND.—This is a small rocky shoal, lying eight miles southwest by south from Moos-a-*bec* light-house. It is nearly circular in outline, about half a mile in diameter, and with depths of thirty-five to forty fathoms.

WESTERN EGG ROCK lies eight miles southwest from Moos-a-*bec* light-house. Its length, in a northeast and southwest direction, is three miles and its breadth one mile. The depths range from twenty to thirty-five fathoms, and the bottom is irregular, sharp, and rocky, being too rough for trawls; hand-lines are, therefore, almost wholly used by the boat-fishermen, who resort to it in summer for cod and pollock.

OLD EGG ROCK bears west southwest from Moos-a-*bec* light-house; distance, six miles. It extends three miles in a southwest and northeast direction, and is one mile wide. The bottom is rocky, with depths ranging from twenty-five to thirty-five fathoms. It is principally resorted to by small boats in pursuit of cod and pollock, which are mainly taken with hand-lines, though trawls are occasionally used.

MIDDLE RIDGE lies three miles west by south from Moos-a-*bec* light-house, and extends one mile northeast and southwest, the width being one-half mile. The depth varies from eighteen to twenty-five fathoms, the bottom being rocky and rough. It is occasionally resorted to by small-boat fishermen, using hand-lines only, but only a few fish are taken.

BROKEN GROUND is a large piece of broken bottom, the eastern end of which bears south by east fifteen miles from Moos-a-*bec* light, whence the ground extends west-southwest to within four miles of Mount Desert Rock; its average width is about one mile. The depths vary from fifteen to one hundred fathoms, the shoaler portions being sharp and rocky, and the deep places consisting of clay and gravel. Some of the spots are half a mile long, and others from one to three miles in diameter, with an average depth of seventy fathoms. Cod are taken on the outside of the grounds, pollock and small cod on the shoals, and hake on the inside. By some this is considered the best fishing-ground on the coast. Several of the spots have special names, as "*Crawley's Rock*," "*Puzzling Rock*," "*Lenke's Rock*," and "*The Ridges*." Fishing continues four months—from June 1 to September 30. Herring are abundant here in their season and are used in large quantities for bait.

The *Ridges*, which form a part of the "*Broken Ground*," bear south from Moos-a-*bec*; distance to the center, nine miles. They are seven miles long, southwest and northeast; two miles wide, and have a depth of from thirty to thirty-five fathoms. The bottom consists of rocks and gravel, on which cod and pollock are abundant.

Crawley's Rock bears south seventeen miles from Moos-a-*bec* light, and has a shoal of about fifteen acres in extent, with a depth of fifteen fathoms and a bottom of sharp rocks.

Puzzling Rock bears south fourteen miles from Moos-a-*bec* light, and has a shoal about half a mile in diameter, on which the depth of water is fifteen fathoms, and the bottom sharp and rocky.

GROUNDS OFF PETIT MANAN.

TIBBETT'S LEDGE bears about east from Petit Manan; distance, four to five miles. (Marks: Schoodic Island, over the green island of Petit Manan, and the Ladle, over Nash's Island.) This ledge consists of two rocky shoals, with a depth of three to three and a half fathoms. The shoals are only about one acre in extent and a quarter of a mile apart, bearing northwest and southeast from each other. To the westward of these shoals the ground is broken nearly to Petit Manan, and this section is a favorite resort for small boats. To the eastward, however, the ledge drops off suddenly into mud. In May, large cod are caught over the muddy bottom, just to the eastward

of the ledge, in a depth of twenty-seven to thirty-four fathoms. In the spring of 1880, three men, with hand-lines, caught three hundred cod here in a single day.

BEN'S GROUND bears east-southeast from Petit Manan; distance, four to five miles. (Marks: Petit Manan light, to the northward of the high or iniddle hill of Mount Desert, and Humpback Mountain, on the west side of Trafton's Island, or Pond Island light-house, to the eastward of Jordan's Delight.) This ground is circular in shape, with a diameter of about three-fourths of a mile, and has a very irregular bottom of rocks and mud. The depths range from fourteen to thirty fathoms. This ground is at present of but little importance, but is occasionally visited by the boat-fishermen in summer for cod and haddock; on muddy bottom, in the immediate vicinity, hake grounds occur.

SOUTHEAST ROCK.—This is a ledge which becomes nearly uncovered at low water on its shoalest part. It bears south-southeast from Petit Manan; distance, four and one-half miles. From the shoaler portion of the ledge the bottom slopes off towards the northeast a distance of four miles, with an irregular bottom, the depth increasing from seventeen to thirty fathoms. The shoal portions are rocky, while the deeper places between are generally muddy. Cod and haddock are taken on this ground by the boat fishermen in May and June, but from July to September hake are the most common fish.

BROKEN RIDGES, "JOE RAY GROUND."—This ground bears south-southeast from Petit Manan, from which the center is seven miles distant. It is two miles long in a southwest and northeast direction, and one mile wide, the depths ranging from twenty-seven to thirty-three fathoms. The bottom is very uneven, and consists of rocks and mud. The shoalest part of the ground is near the center. The depths vary so greatly over short distances that a boat at anchor, swinging with the tide, may find a difference in depth of from five to six fathoms. This ground is considered very good for cod and haddock. It is resorted to by small vessels in the spring and by open boats during the summer.

BLACK LEDGES GROUND.—This is an excellent fishing-ground for haddock, situated between "Jordan's Delight" and the "Halibut" or "Black Ledges." The fish strike in very plentifully in summer, probably in pursuit of herring. One day, in the first part of July, 1879, three persons in one boat, with a trawl of seven hundred hooks, took eleven hundred haddock by under-running on this ground, and more than five thousand haddock were probably taken there that day by all of the small boats fishing there. The haddock do not usually remain long.

GROUND OFF MOUNT DESERT ISLAND.

BAKER'S ISLAND RIDGE.—This is a narrow ridge making out from Baker's Island in an east by north direction. The eastern part bears south by east from Schoodic Island, from which it is distant three-fourths of a mile. The ridge is much broken, with an average width of one-half mile, and depths varying from twenty to twenty-five fathoms. The bottom is rocky in some places and gravelly in others. As a rule, but little fishing is done on the shoaler portions of the ridge, but where the bottom slopes off to depths of thirty to thirty-five fathoms, with a bottom of mud, hake are generally quite abundant from July to October inclusive. During that season the ground is resorted to by small vessels and open boats.

MARTIN'S GROUND.—The center of this ground bears west-southwest from Schoodic Point, from which it is distant about three miles. It is a rocky patch, with depths of fifteen to twenty-five fathoms. Its extent does not exceed four or five acres. This is not an important fishing-ground, but is sometimes resorted to by the boat-fishermen in the fall, when a limited amount of cod are taken with hand-lines.

EGG ROCK BROKEN GROUND.—This is a rocky ridge which makes out in a south by west direction from Egg Rock ledges a distance of about two miles, and has a width of about half a mile. The bottom is irregular, and the depth of water ranges from nine to fifteen fathoms. This ridge, together with Martin's and Seavey's Grounds, divide the western or Baker's Island mud channel from the Schoodic mud channel, both of which are good hake grounds, with depths varying from thirty to forty fathoms. The bottom consists of mud. Mr. Nathan Hammond, of Winter Harbor, Gouldsborough, Maine, states that from 1830 to 1840 thirty to forty vessels were frequently seen at anchor in Baker's Island Channel at one time, all of them being engaged in catching hake. These fish are much less abundant now upon these grounds than formerly, but nevertheless they are more or less resorted to at present by open boats and vessels during the summer, and large catches are still taken by the local fishermen.

INNER SCHOODIC RIDGE bears southeast by south from Baker's Island, from which the center of the ground is twelve miles distant. It is nearly circular in shape, with a diameter of about four miles, the depths ranging from eighteen to sixty fathoms. The bottom is composed of rocks, gravel, and mud; the shoaler portions are sharp and rocky.

OUTER SCHOODIC RIDGE.—The northwest part of this ridge bears southeast from Baker's Island, from which it is distant twenty-two miles. It is about eight miles long in a southwest and northeast direction, being nearly parallel with the neighboring coast. In the widest part its breadth is about six miles. The bottom, which is composed of rocks and gravel in the shoaler parts and of mud in the deeper portions, is quite broken and irregular, the depths of water varying from twenty-two to eighty fathoms. This ridge lies seven miles outside of the Inner Schoodic Ridge, and is considered one of the best shore fishing-grounds on the coast of Maine.

MOUNT DESERT INNER RIDGE.—The center of this ground bears southeast one-quarter east from Schoodic Island, about fifteen miles distant. It extends four miles in a west by south and east by north direction, and has a width of half a mile, the depths ranging from thirty to forty-five fathoms. On the shoaler parts the bottom is rocky, but elsewhere it consists of sand and gravel. It is considered a good fishing-ground for several species of the cod family during April, at which time both trawls and hand-lines are used.

MOUNT DESERT OUTER RIDGE bears southeast by east from the big hill of Mount Desert Island. The distance from Schoodic Island to the center of this ground is twenty-five miles. It is two miles long, east by north and west by south, and about three-fourths of a mile wide. The depths vary from forty-five to sixty fathoms. On the shoal part the bottom is rocky, but toward the sides sand and clay predominate. Although of small size, this is considered a good fishing-ground for cod, etc., from April to July. Fishing is done principally with trawls.

ENOCH'S SHOAL bears east-northeast from Great Duck Island; distance, three miles. This is a small hummock on the outer part of a ridge that extends out to it from Big Duck Island. It has a sharp, rocky bottom, and an average depth of eighteen fathoms.

BANK'S GROUND.—The center bears southeast by south from Great Duck Island, from which it is distant five miles. This is a small patch of ground, about one and one-half miles long, in a southwest and northeast direction, by one-fourth of a mile wide, and has depths varying from thirty-five to fifty fathoms; the bottom is muddy. It is principally resorted to by the small-boat hake fishermen.

SHELL GROUND bears southeast from Long Island Head, from which the center of the ground is distant about six miles. It extends two miles in a southwest and northeast direction, and is about half a mile wide. It has a shoal of twenty-five fathoms in the middle portion, the bottom of which is composed of sharp rocks. On all sides of this shoal the bottom is quite

irregular, consisting of pebbles and mud. The greatest depth near the edge of the bank is about fifty fathoms. This ground is especially good for haddock in July and August, during which months it is resorted to by the small boats of the region, the fishing being carried on principally by means of trawls.

ABNER GROUND bears south-southeast from Gott's Island; distance, eight miles. It extends one and one-half miles in a northeast and southwest direction, and is one-fourth of a mile wide. The bottom, which is composed of rocks and mud, is broken, the depth of water ranging from twenty-five to fifty fathoms. This is a good haddock ground in July and August, and is visited by the same class of fishermen that resort to "Shell Ground" and other similar places in that vicinity.

GROUND OFF ISLE AU HAUTE.

GRUMPY.—The Grumpy bears southeast from the western head of Isle au Haute; distance, ten miles. This ground is two and one-half miles long, northeast and southwest, by three-fourths of a mile wide, and has a small shoal of fifteen fathoms on the northeast part. The general depth varies from thirty-five to forty fathoms, the bottom being gravelly. It is considered one of the best inshore grounds for cod the entire year, for haddock in the winter, and hake, just off the edge, in the summer. Both trawls and hand-lines are used.

HATCHELL GROUND bears southeast by east three-quarters east, about nine and one-half miles, from the western head of Isle au Haute, the marks being as follows: Eastern Mount Desert Hill in the middle saddle of Long Island, and Little Spoon Island in the great or center saddle of Isle au Haute. This ground is but little more than a mile in diameter, and is said to have a shoal of fifteen fathoms, which is so small, however, as to be difficult to find. The general depth varies from twenty-five to forty fathoms, the shoalest part being in the middle of the ground, whence the bottom slopes off gradually on all sides. The character of the bottom is sharp and rocky on the shoal, but gravelly and pebbly toward the sides; at the edge of the ground the bottom consists of soft mud. Various low forms of animal life, the most of which serve as food for fishes, are constantly brought up on the hooks of the trawlers. This ground, next to the "Grumpy," is considered the best one inside of Mount Desert Rock; cod and a few pollock are caught here in the spring; hake are taken on the mud near the edge of the ground in summer, and haddock are abundant in winter. Both hand-lines and trawls are used.

BLUE HILL GROUND bears east by south three-quarters south (approximate) from the western head of Isle au Haute; distance, about seven miles. The marks for determining the locality of this ground are as follows: Brimstone Island, out by the western head of Isle au Haute, and Blue Hill, on the west side of Marshall's Island. These marks lead to a depth of twenty-five fathoms on the northeast part of the ground, from which the bottom drops off gradually to the southwest, in which direction a depth of forty fathoms is reached a mile from the shoaler portion, which is about half a mile wide. The bottom consists of gravel and pebbles. This is a good locality for cod during the spring and fall, but is best for haddock during the entire winter. Both trawls and hand-lines are used.

INNER HORSE REEF bears southeast three-quarters east, one and a half miles, from the eastern ear of Isle au Haute. It contains a shoal of twenty-five fathoms, about one-eighth of a mile in diameter. From this shoal the water gradually deepens toward the northeast for a distance of a half mile, when it drops off into mud. The depth of the northeast portion is about thirty-five fathoms. The bottom consists of pebbles and gravel. This is a good ground for cod in the spring and fall, and for hake, close to the edge, in the summer. Trawls and hand-lines are used.

Chart No. 8.

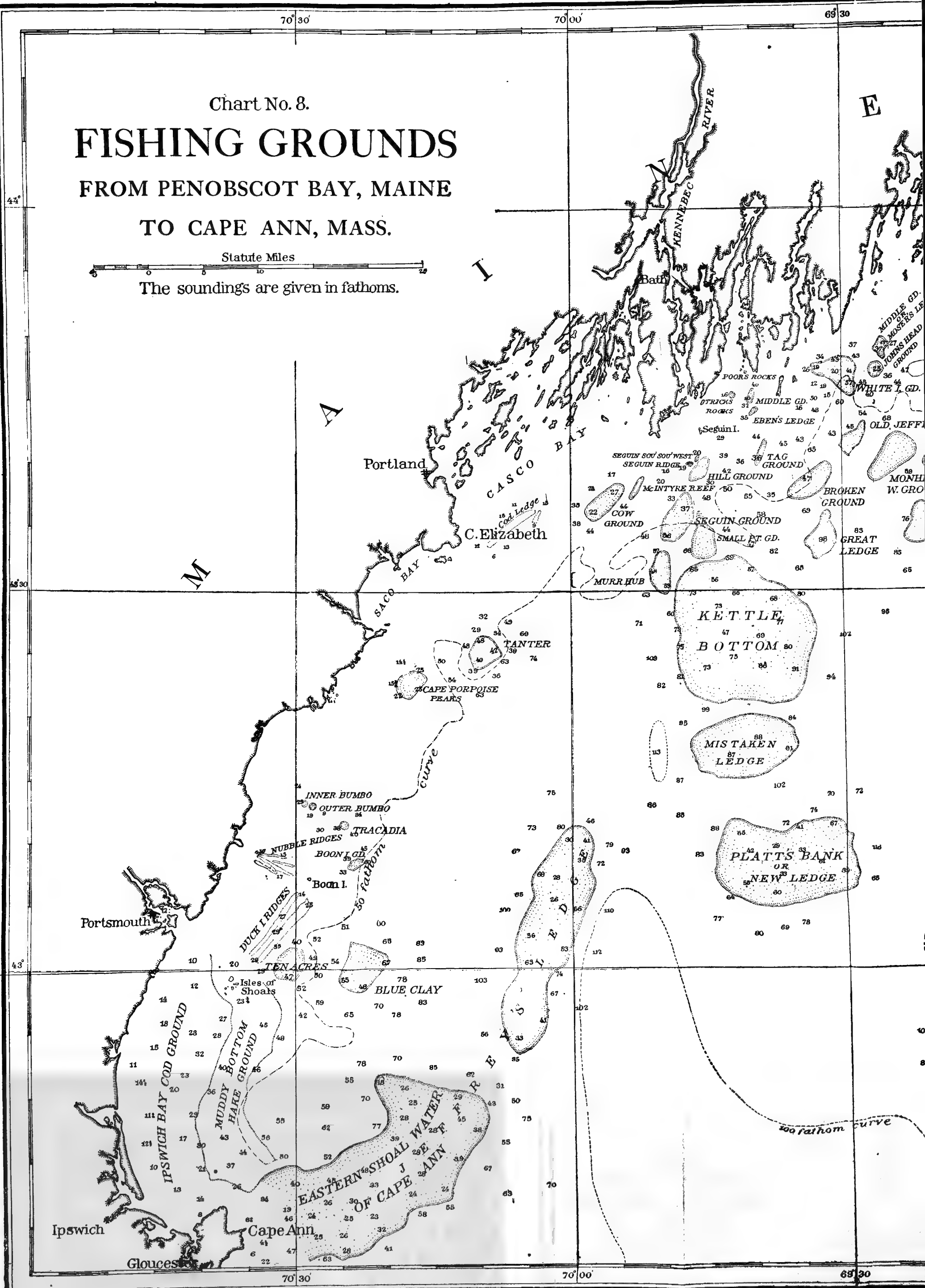
FISHING GROUNDS

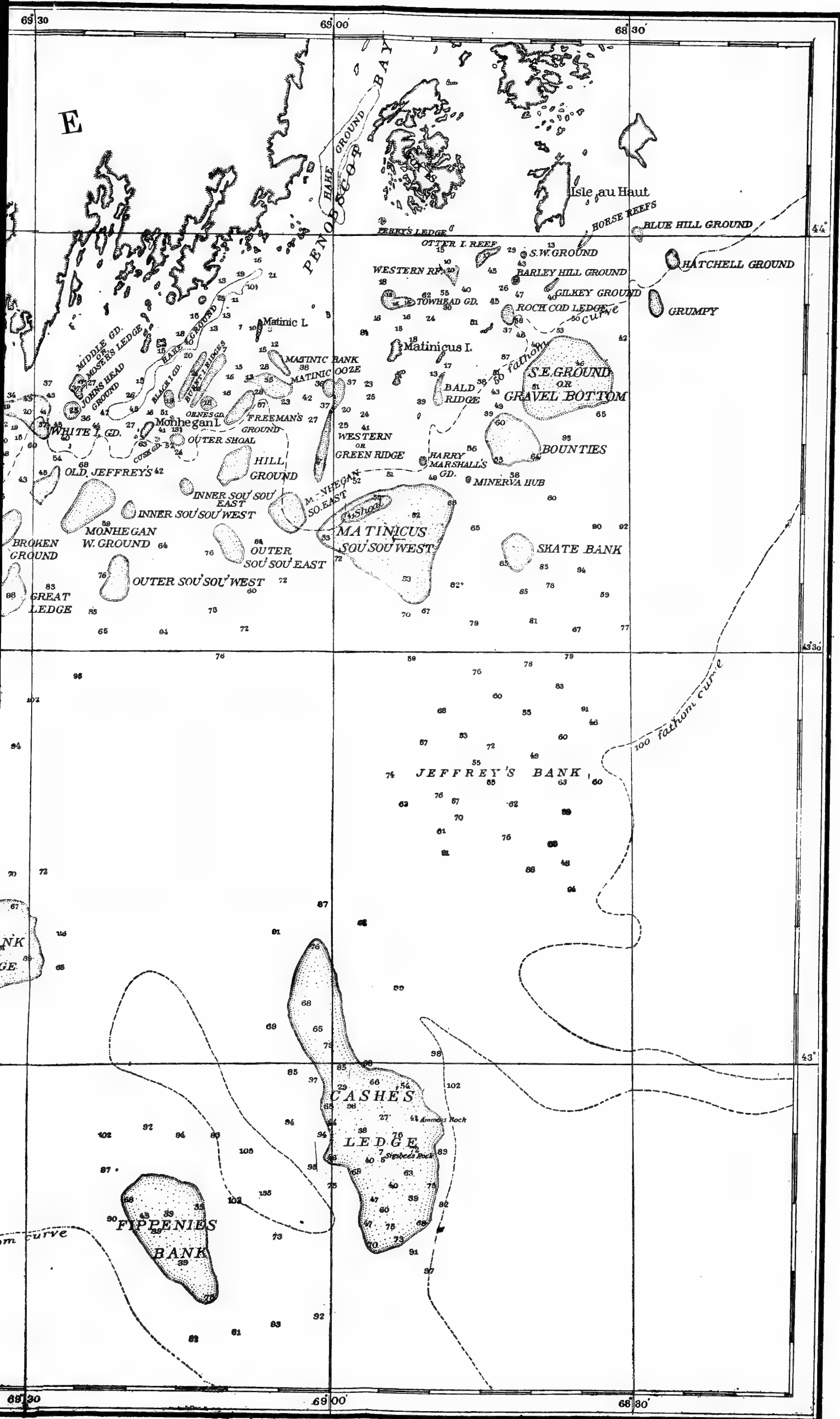
FROM PENOBSCOT BAY, MAINE

TO CAPE ANN, MASS.

Statute Miles

The soundings are given in fathoms.





OUTER HORSE REEF lies but a short distance to the southwest of the Inner Horse Reef, there being only a narrow gully between the two. The shoal, which is small, and falls off rapidly on all sides, has a depth of thirty fathoms. Over a space a quarter of a mile in diameter the bottom is gravelly. This ground is resorted to for the same fish, and at the same seasons, as the inner ridge.

SOUTHWEST GROUND lies two miles southwest from the western head of Isle au Haute; is circular in shape, one-half mile in diameter, and has a gravelly bottom, with depths of from thirty-five to forty fathoms. This is a good locality for large cod from April to June and from September to November. A few haddock and pollock are taken with the cod. Hand-lines are principally used, with clam and herring bait.

BARLEY HILL GROUND bears north-northeast from Seal Island and south-southwest from the western head of Isle au Haute, being directly in a line between the two, and very nearly equidistant from each, the distance being three and one-half miles. This is a small ground, not over half a mile in diameter, circular in shape, with depths of from twenty-eight to thirty fathoms, and with a mixed bottom of rocks and mud. It is a good fishing-ground for cod in the fall and spring, and a few halibut are also occasionally taken upon it. Both trawls and hand-lines are used.

GILKEY GROUND bears south from the western head of Isle au Haute; distance, four miles. It extends in an east-northeast and west-southwest direction, and is about one and one-half miles long by one-third of a mile wide. It has a rocky bottom on the shoaler portion, where the depth is twenty-three fathoms, but it slopes off gradually to a depth of thirty-five fathoms on the southwest part, where the bottom is gravelly. The bottom is comparatively smooth, and both trawls and hand-lines are used upon it. This is a good ground for cod during the spring and fall, for haddock during the winter, and for hake, near the edge, in the summer.

ROCK-COD LEDGE.—This ledge lies about one mile northeast of Seal Island (off Isle au Haute), and has a depth of only three and one-half fathoms on the shoalest part. On all sides it slopes off gradually for quite a distance. The bottom consists of sharp rocks, and is broken in places. This is a very fair ground for rock-cod during the spring and fall, and has always been considered an excellent locality for hooking mackerel when these fish are in this vicinity.

SOUTHEAST GROUND AND GRAVEL BOTTOM.—This is an extensive piece of flat ground lying to the southward of Seal Island, the western part bearing a little east of south, and the eastern part about east-southeast from the island. It is five or six miles in diameter, and although forming a single stretch of ground, the eastern portion has received the name of Southeast Ground, while the western part is called the Gravel Bottom. The latter name is derived from the character of the bottom, which is pebbly and gravelly on the western part, and muddy, with patches of gravel, on the eastern part. The western portion has depths of from thirty-five to forty-five fathoms, while the eastern part varies in depth from forty to sixty fathoms. This is a good ground for cod in the spring, for hake in the summer, and for haddock in the winter. Fishing is done mostly with trawls.

LAISEDELL'S GROUND.—This is a small rocky spot outside of the Brandy Ledges, and is not more than a fourth of an acre in extent. It has a depth of twenty fathoms, with a sharp, rocky bottom. It is considered the best fishing-ground for cod and haddock in Isle au Haute Bay.

SADDLE-BACK REEF bears about south from Saddle-Back Ledge, from which the inner part is distant three-fourths of a mile. It is two-thirds of a mile long, north and south, and quite narrow, being not more than one-fourth of a mile in width. The depths vary from fifteen

to thirty-five fathoms, and the bottom is broken and rocky. Cod are caught during May and June with hand-lines.

OTTER ISLAND REEF, SNIPPER SHIN, and WESTERN REEF.—These names are applied to different sections of an irregular, broken piece of rocky ground, that lies about half way between Vinal Haven and Seal Island. Otter Island Reef, by which name the eastern section is known, lies about four miles west by south one-quarter south from the western head of Isle au Haute, and has depths of from ten to twenty-five fathoms, with a rocky and broken bottom, on which trawls can seldom be used. It is a favorite ground for cod and haddock during all the seasons when these fish are in shoal water, but is best for cod in the spring and for haddock in the fall. Snipper Shin is only a westerly continuation of the Otter Island Reef, and lies between it and the Western Reef. The general direction of this ground is about northwest until it joins the Western Reef, which trends more to the southwest. It contains a shoal of seven fathoms, about which the water is twenty-five fathoms deep in places. The general characteristics of the ground are similar to those of Otter Island Reef, but small halibut are occasionally taken in addition to cod and haddock. The Western Reef has the same depth and character of bottom as the other two pieces of ground.

GROUND OFF AND ABOUT MATINICUS ISLAND.

BALD RIDGES.—These ridges begin just outside of Wooden Ball Island, and run off in a nearly direct line for Matinicus Rock. They are almost parallel with one another, and quite close together, the distance between them not being over half a mile. They are from a fourth of a mile to half a mile in width each, and have depths of from fifteen to thirty fathoms, with a broken, rocky bottom. The shoalest part is distant about a mile from Wooden Ball Island, and from there the depth increases toward the southern end. This is a good ground for cod at all seasons when they are on the coast, the shoal being a favorite resort of the rock-cod.

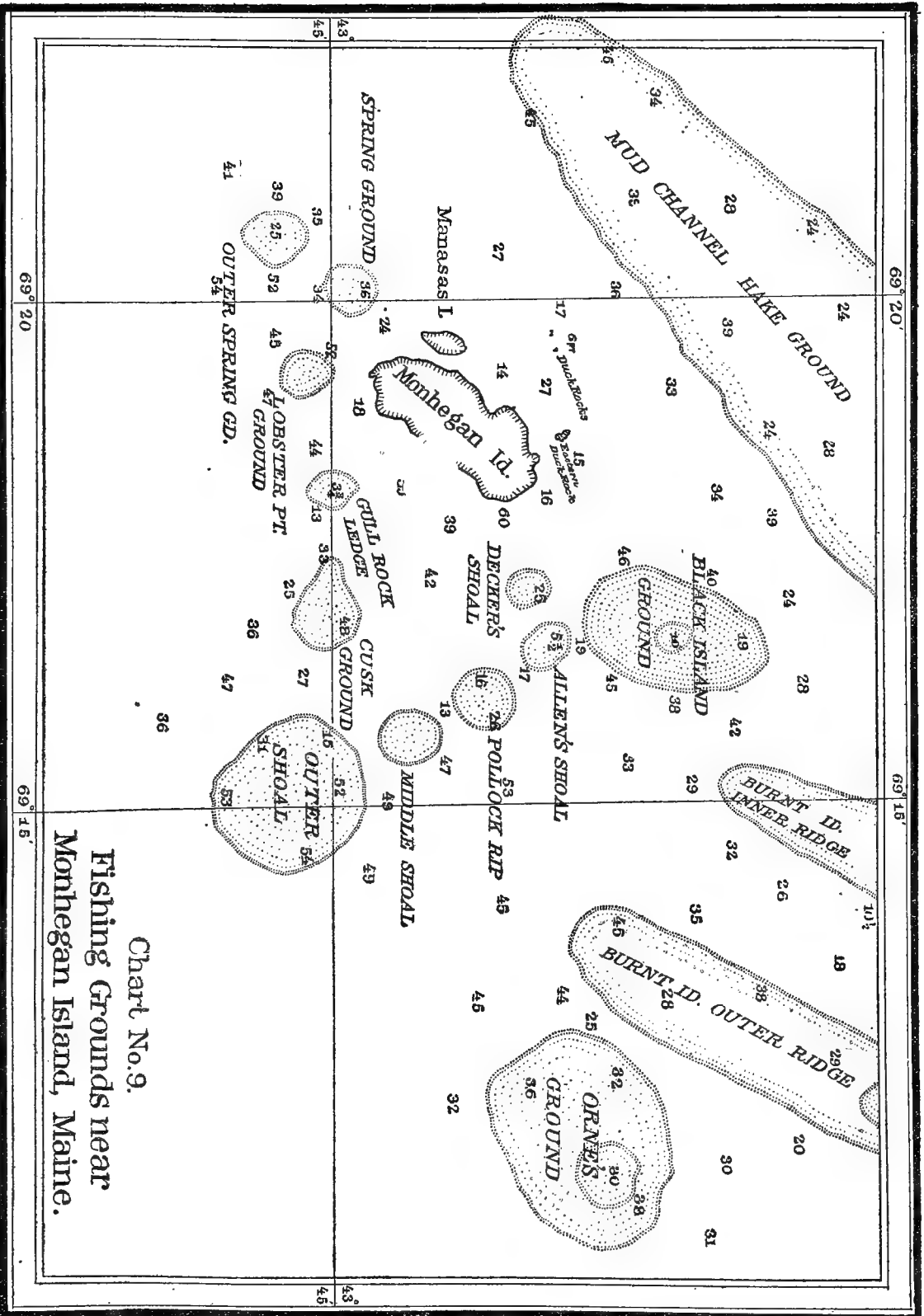
HARRY MARSHALL'S GROUND bears south by west from Matinicus Rock, distance, about three miles, and has an area of not more than two acres. The shoaler portion has a depth of thirty-five fathoms, with gravelly bottom; on the edge the depth is forty-five fathoms, and the bottom consists of rocks and mud. A good ground for cod in spring and for hake in summer.

THE BOUNTIES bears southeast by south half-south, distant six miles, from Wooden Ball Island. It is about four miles in diameter, and nearly circular in shape, with depths of forty to sixty fathoms. The bottom consists of gravel and rocks, and is somewhat broken. It is a good ground for cod and cusk in the spring and fall and for haddock in the winter.

MINERVA HUB.—This is a small gravelly spot, not more than a fourth of a mile in diameter, with a depth of thirty-five fathoms, and abounds in cod during the spring and fall. It bears south-southeast from Matinicus Rock; distance, nearly six miles.

SKATE BANK bears south-southeast, distant twelve miles, from Matinicus Rock; is about two miles in diameter, and nearly circular in shape, with depths of thirty-five to sixty fathoms. The bottom is gravelly, but quite uneven. The best season for fishing on this ground for cod and cusk is from April to July.

MATINICUS SOUTH-SOUTHWEST GROUND.—This ground bears south-southwest from Matinicus Rock, from which the inner edge is distant about six miles. It extends about nine miles north and south, and has about the same width, being nearly triangular in shape, and broadest at the northern end. On the northern part there is a shoal of about thirty fathoms, two miles long east and west, and one mile wide. Sharp rocks cover the shoal, but the ground is not broken and drops off gradually to depths of fifty and fifty-five fathoms, and even to sixty fathoms on the



Another lot of small patches lie westerly from the Outer Shoal and close to Monhegan Island. These are, the Cusk Ground, with depths of from twenty to thirty-five fathoms; Gull Rock Ledge, a shoal of three and three-fourths fathoms; Lobster Point Ground, with depths of fifteen to thirty fathoms; Inner Spring Ground, fifteen to thirty fathoms; and Outer Spring Ground, twenty-five to thirty-five fathoms. All of these are fished on for cod, haddock, and pollock by small boats, principally in the early spring and late fall. Not much distinction can be made between these grounds, as a boat may fish on several of them in the course of a single day. The Spring Grounds, however, are so near the harbor that they are generally the first visited in the spring; hence the name.

GROUND NORTH, NORTHEAST, AND EAST OF MONHEGAN ISLAND.

HAKE GROUND or MUD CHANNEL.—This is a soft, muddy channel, extending from just outside of White Head to abreast of Monhegan Island, on the northern side. The depth varies from twenty to forty-five fathoms, and it was formerly one of the best hake grounds along the shore. It is now of less importance.

BLACK ISLAND GROUND bears east-northeast from Monhegan Island, from which the inner edge is distant about one mile. It is about one mile in diameter, and has a small shoal of ten fathoms, with a sharp, rocky bottom in the center. From this shoal the depth increases gradually to the edge of the ground, where it reaches forty fathoms. Beyond the depth of twenty-eight to thirty fathoms the bottom is gravelly and smoother. Monhegan Island boats fish on this ground all the season, from spring until fall, cod being caught in the spring, pollock on the shoal in the summer, and cod and hake on the edge in summer and fall.

BURNT ISLAND INNER RIDGE bears northeast by east from Monhegan Island, from which the inner edge is distant about three miles. This is a broken piece of ground, with depths varying from fifteen to twenty fathoms, the bottom being generally rocky and gravelly, with occasional mud holes. It extends in a northeast direction about four miles, reaching nearly to the Roaring Bull Ledge, and is about half a mile wide. Cod are taken here in the spring, from April to June, and cod and hake in the fall, from September to November.

BURNT ISLAND OUTER RIDGE.—This runs parallel with the Inner Ridge, at a distance from it of about three-fourths of a mile. It has depths varying from five to twenty-five fathoms, the bottom being somewhat less broken than on the Inner Ridge. This ground is fished on for the same species as are taken on the Inner Ridge.

ORNE'S GROUND bears east, distant four and one-half miles, from Monhegan light to the center. It is about a mile and a half long, east and west, and about a mile wide, with depths varying from thirty to forty-five fathoms. On the shoal part the bottom consists of sharp rocks and is broken, but on other portions of the ground it is gravelly and pebbly and quite level. The shoal lies toward the eastern part of the ground. This is a good locality for cod.

GROUND SOUTHEAST OF MONHEGAN ISLAND.

OUTER SHOAL lies about three miles southeast from Monhegan light-house. It is circular in shape, one and one-half miles in diameter, and has depths ranging from ten to thirty-eight fathoms. A small rocky shoal of ten fathoms is located near the center of the ground, the remainder having a gravelly bottom. Cod occur here from spring until fall, and the shoal is also a good locality for pollock.

MONHEGAN INNER SOUTH-SOUTHEAST GROUND.—This shoal bears south-southeast from Monhegan light-house, from which the center is distant about five miles. It is nearly circular in

shape, and about a mile and a quarter in diameter. It has depths of thirty to fifty fathoms and is shoalest on the eastern part. This shoal is broken and rocky, but on the other parts of the ground the bottom is gravelly, with spots of mud. Cod and cusk are the principal fish taken here, although a few haddock, pollock, and hake are also caught. June is considered the best month on this ground for small boats, which usually fish until they are driven away by dogfish.

MONHEGAN OUTER SOU'-SOUTHEAST GROUND is about three miles outside of the Inner Sou'-Southeast, on the same bearing, and is similar in size and shape to the Outer Sou'-Sou'-west Ground. The bottom is rocky and muddy, or composed of hard clay, and the depths range from thirty-five to fifty-five fathoms. This ground is resorted to by the same kinds of fish that are caught on the inner shoal.

MONHEGAN SOUTHEAST GROUND bears southeast from Monhegan Island, from which the center is distant twelve miles. It is nearly three miles in diameter, and circular in shape, but the bottom is so broken, the depths within very short distances varying from thirty-five to seventy-five fathoms, that it is somewhat difficult to find. The bottom consists of rocks, gravel, and mud. This is considered a good locality for cod from April to July; both trawls and hand-lines are used.

HILL GROUND bears nearly south-southwest nine miles from Matinic, and is between three and four miles long, southwest and northeast, and about two miles wide. The shoalest portion has a depth of thirty-five fathoms, with rocky bottom; but from here it slopes off gradually to a depth of fifty fathoms, with a mixed bottom of gravel, rocks, and mud. The best fishing it offers is for hake. Both trawls and hand-lines are used.

GROUNDS SOUTHWEST OF MONHEGAN ISLAND.

MONHEGAN INNER SOU'-SOU'WEST GROUND.—This piece of ground derives its name from its bearings, lying as it does to the south-southwest of Monhegan light-house, at a distance of about five miles; its length in a south-southwest and north-northeast direction is about one and one-half miles, and its width one and one-fourth miles. It has a sharp, broken, rocky bottom, and includes a very small shoal of twenty fathoms and several other hummocks with somewhat greater depths. The deepest water is fifty fathoms. This ground is fished on mostly by the Monhegan boats in the spring, from May until July, for cod and pollock.

MONHEGAN OUTER SOU'-SOU'WEST GROUND.—This ground bears the same as the last, the center being nine miles distant from Monhegan light-house. It is four miles long, south-southwest and north-northeast, and about two miles wide. The depths range from sixty to eighty fathoms, the bottom being generally pebbly and quite level. This is considered a good ground for cod in the spring and fall, and is resorted to by the small boats from Monhegan and by small fishing-vessels, ranging in size from fifteen to twenty tons, and owned between Portland and Isle au Haute, which visit these shoal spots during the spring and summer.

GROUNDS WEST OF MONHEGAN ISLAND.

OLD JEFFREY'S.—This is an exceedingly good ground for fish, and it is said that better fishing may be obtained here than on any other ground of its size in the vicinity. In the spring, cod are most abundant, while hake, together with cod and pollock, are taken in the late summer and fall. This ground bears southeast from Pumpkin Rock from which the center is distant about six miles. It is about three miles long, southwest and northeast, and about a mile wide. The depth varies from twenty-five to fifty fathoms, the bottom being broken and consisting of rocks, gravel, and mud.

MONHEGAN WESTERN GROUND.—This ground, which is of considerable extent, lies about four and one half miles west-southwest from Monhegan Island. It has depths of twenty-two to forty-five fathoms, the bottom being rocky and gravelly, and considerably broken in places. It is considered a good feeding-ground for fish, cod being abundant in the spring and hake in the summer, when dogfish are not too plentiful. The length of the ground is about four or five miles, and it is nearly two miles wide on the eastern or widest portion, gradually narrowing toward the western end, where the breadth does not exceed one mile.

BROKEN GROUND.—The center of this ground bears nearly south from Pumpkin Island (entrance to Boothbay Harbor); distance, seven miles. It extends four miles in an east-northeast and west-southwest direction, and has an average width of one and three-fourths miles. The depths range from thirty-five to fifty fathoms, the bottom being composed of rocks and mud. Cod occur here the year round, and hake are taken from June to September.

GREAT LEDGE bears south by east, distant twelve miles, from Cape Newagen; it is about four miles long, south-southwest and north-northeast, and from one to two miles wide. It is said to have a shoal of fourteen fathoms on the northern edge, and another of twenty-two fathoms near the center. These shoals are broken and rocky, but the main portion of the ground, having depths of thirty to forty-five fathoms, is mostly composed of sand, and is quite level, sloping gradually toward the edge. This is a good ground for haddock and cod in the winter and for cod in the spring; a few pollock are also taken at times.

GROUND BETWEEN MONHEGAN ISLAND AND PEMAQUID.

MIDDLE GROUND.—This piece of shoal ground lies about in midchannel between Monhegan Island and Pemaquid, and has a shoal of three fathoms on the eastern part, where the water breaks in heavy weather. This shoal is called Moser's Ledge, and is broken and rocky, but the ground slopes off gradually to the southwest, reaching a depth of forty-eight fathoms, with a bottom of gravel and mud on the deepest part. The ground is about two miles long, southwest and northeast, and about a mile wide. Boats fish here for cod and haddock in the spring.

JOHN'S HEAD GROUND lies about four miles south-southeast from Pemaquid Point. It has depths of twenty-five to thirty-five fathoms, with a sandy bottom, and is a good locality for cod during April and May, when it is much resorted to by small boats from Bristol. This ground is circular in shape and about one mile in diameter.

WHITE ISLAND GROUND bears east-southeast from the White Islands, from which the inner edge is distant about half a mile and the outer edge about four miles. In outline this ground is triangular and somewhat resembles a harrow, being widest at the outer end. It is very broken and uneven, the depths ranging from six to thirty fathoms. In some places the bottom is gravelly, but on the shoals it consists of sharp, broken rocks. These small, rocky spots are known by other names, for instance, Brown's Head Ground, on which the fishermen catch a few rock-cod, and a number of others which are resorted to by small boats.

GROUND OFF SEGUIN ISLAND.

HILL GROUND bears south-southwest from Seguin Island, distance about three miles. It is three miles long, southwest and northeast, and about three-fourths of a mile wide. The depths range from twelve to twenty-three fathoms, and the bottom is uneven. The northeast part is very rough, with several shoal spots, having depths of twelve to fourteen fathoms, while between them the depths vary from twenty to twenty-three fathoms. The southern part, though rocky, is

more even than the northern. Cod, hake, and pollock are the principal fish found here. Both trawls and hand-lines are used.

SEGUIN SOU'SOU'WEST GROUND bears south-southwest from the western part of Seguin Island, from which the center is distant four miles. It is a rocky shoal, about one-half mile long by two hundred yards in width, with a shoaler portion in the center about one-half acre in extent. The marks are Elwell's Rock, touching the west side of Seguin, and Fuller's Rock, touching the southern part of Bald Head. The depths range from seven to fourteen fathoms. This ground is resorted to by boat fishermen in September for rock-cod, fishing wholly with hand-lines. It is evidently a south-southwest continuation of the Hill Ground.

SEGUIN RIDGE bears about southwest by south from Seguin Island; distance, a little more than three miles. It is about one mile long in an east-southeast and west-northwest direction, and one-fourth of a mile broad. It consists of a number of small, rocky hummocks, with depths of nine to fourteen fathoms, on which cod are taken by the small-boat fishermen in the fall.

SEGUIN GROUND bears southwest by south from Seguin Island, from which the center is distant about seven miles. It is about four miles long, southwest and northeast, and a little more than two miles broad in the widest part. There is a small hummock, called Bumper's Island Ground, on the northern end, with a depth of thirteen fathoms. The northern part is mostly rocky, but toward the south the bottom is gravelly and sloping, so that on the middle and southern portions there are depths of thirty-five to forty-five fathoms. Cod, hake, haddock, and pollock are taken on these grounds, which are considered to furnish the best fishing in the vicinity of Seguin Island. Both trawls and hand-lines are used.

MCINTIRE REEF bears south-southwest from Bald Head (Cape Small Point); distance to the center, four and one-half miles. It is two miles long, northeast and southwest, by one-half mile wide. This reef is very broken and hummocky, with a rocky bottom, and depths of water ranging from fourteen to twenty fathoms. It is resorted to by the small-boat fishermen of Casco Bay, who fish for cod with hand-lines. Just to the eastward of this is a piece of bottom composed of hard mud and shells, where hake are usually quite abundant in the summer.

COW GROUND bears nearly southwest from Bald Head, from which the center is distant six and one half miles. This ground is nearly four miles long, in a northeast and southwest direction, and about one and one-half miles wide. The northeast portion is rocky and rough, with depths varying from sixteen to eighteen fathoms, while on the southwest part gravel and pebbles predominate, and the bottom slopes to depths of twenty to thirty fathoms. Cod and pollock are the principal fish occurring here.

MURR HUB bears south by west one-quarter west from Small Point, from which the center is distant ten and three-fourths miles. This ground is three miles long, north and south, and has an average width of one and one-half miles. The depths vary from thirty-four to forty-five fathoms. The inner part of the Hub is shoalest, and there the bottom consists of sharp, broken rocks. From this shoal the ground slopes gradually to the south, where it is composed of sand and gravel. Large quantities of marine invertebrates, affording food for the fishes, are brought up on the fishermen's hooks here as elsewhere. Cod occur from spring until October, hake from June to October, and haddock during the winter. Trawls only are used.

TAG GROUND lies between the Broken Ground and Seguin Island, bearing east-southeast from the latter; distance, five miles. This is a narrow, rocky ridge, about two miles long in a north northeast and south-southwest direction, with an uneven bottom and with depths varying from fourteen to thirty fathoms. It is principally frequented by small fishing boats.

KETTLE BOTTOM.—The center bears south from Seguin Island, from which the inner edge of the ground is distant ten miles. Its length is twelve miles in a north and south direction, and its width about ten miles, the shape of the ground being nearly circular. This is an uneven piece of bottom, consisting of rocks, gravel, and mud, the depths ranging from twenty-five to seventy-five fathoms. This is considered one of the best, if not the best, fishing-ground on this part of the coast. Cod are the most abundant fish and are taken the year round. Haddock abound in the winter. More fish are taken from this bottom than from any other single ground in the vicinity of Seguin. Harpswell and Portland boats fish here.

GROUND OFF CASCO BAY.

WEST COD LEDGE consists of a succession of rocky patches, extending about four and one-half miles in an east-northeast and west-southwest direction, with a width of about half a mile, the southwestern end of which bears southeast three-quarters south from Portland Head light; distance, four and three-fourths miles. The northeastern extremity lies from six to seven miles east-southeast from Portland Head light. The shoalest portion of this ledge has a depth of fourteen to eighteen feet; on other parts the depths vary from five to twenty-two fathoms. The bottom is irregular and composed of rocks and gravel. This is a favorite ground for small-boat market fishermen from Portland, cod and haddock being the fish principally taken.

GROUND OFF CAPE PORPOISE.

Lying off Cape Porpoise, between the bearings of southeast and south-southwest, and at distances varying from six to eight miles, are a number of small, rocky or pebbly patches of ground, having depths ranging from eighteen to twenty-five fathoms. During certain seasons they abound in cod and haddock and are visited by the fishermen of the vicinity.

TANTER bears south from Cape Elizabeth, from which the center is distant eight miles. It is from two to three miles in diameter, with a depth of about forty fathoms, and a bottom of rocks and gravel. An excellent fishing-ground for cod in the spring.

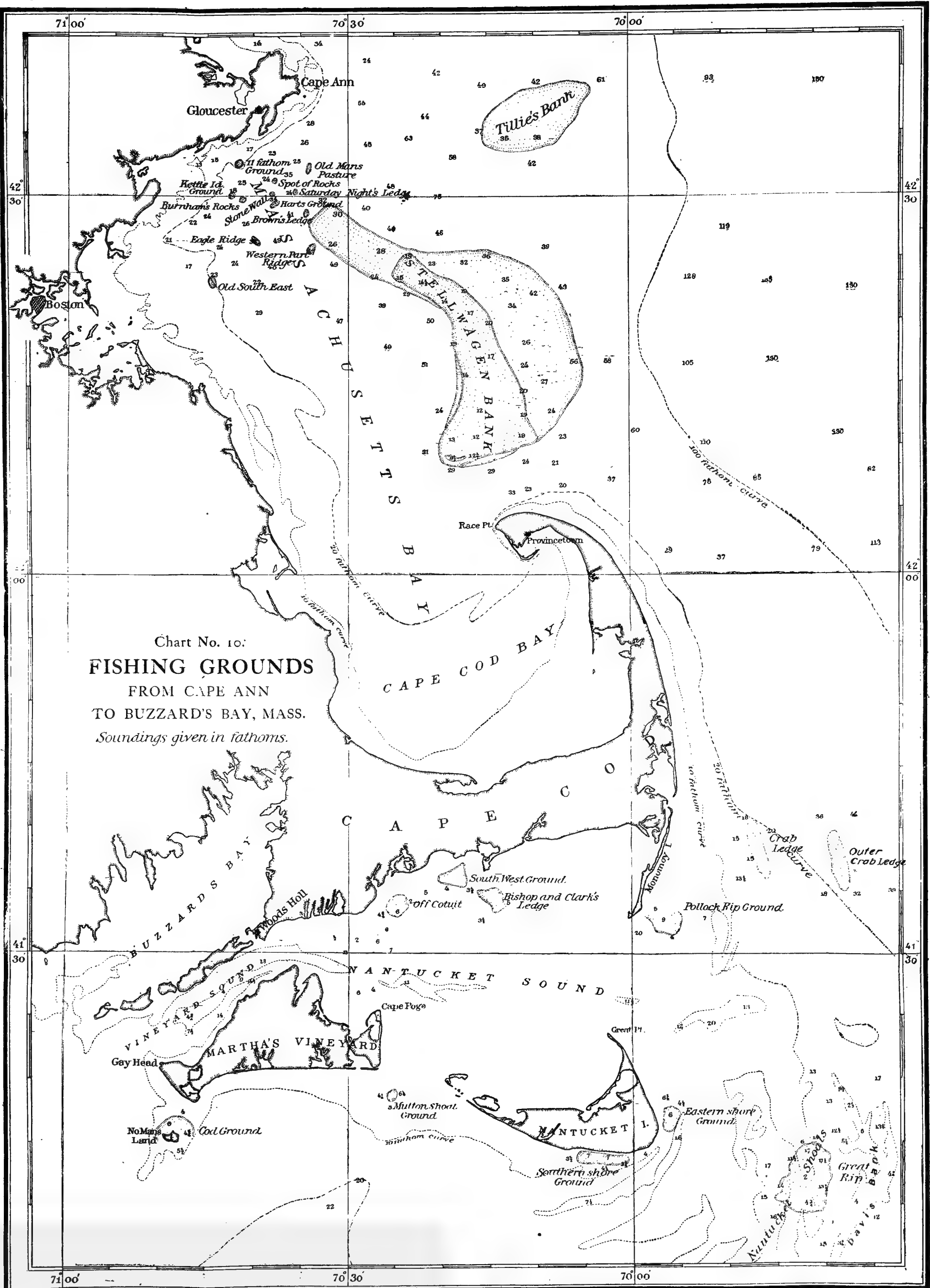
OUTER AND INNER BUMBO.—These are two small, rocky patches (large enough for only a single vessel to lie upon) bearing northwest from the Tracadia Ground, from which they are distant two and one-half and three miles, respectively, the Outer Bumbo being the nearest.

NUBBLE RIDGES consist of four or five narrow, rocky ridges, bearing southeast from the Nubble, and extending in the direction of Boone Island; they begin near the main shore and extend nearly to the island. The depths of water upon them vary from eleven to twenty fathoms. These ridges are much resorted to by small vessels and open boats, and good catches of cod and haddock are made in the spring and fall, but especially in the latter season, when both trawls and hand-lines are used.

CAPE PORPOISE PEAKS are a number of small, rocky patches, bearing about southeast from Cape Porpoise, from which they are distant four to five miles. These spots are in depths of twenty to forty fathoms, are considered good grounds for cod, haddock, and cusk, and are much resorted to by the boats and small vessels of the vicinity.

TRACADIA bears northeast from Boone Island, from which it is distant five miles. It is one-half mile in diameter; has a depth of fifty fathoms, and a bottom of rocks and gravel. A good haddock ground the entire year.

BLUE CLAY bears south-southeast from Boone Island, from which it is distant eight miles. This ground is nearly square, and four to five miles across, with depths ranging from forty-eight



to sixty fathoms, and a bottom of tough blue clay. This is the best winter haddock ground in the vicinity, and is much resorted to at that season by the haddock trawlers.

DUCK ISLAND RIDGES.—These are two narrow, rocky ridges running out from Duck Island (one of the Isles of Shoals) in the direction of Boone Island, reaching to within a mile of the latter. The depths range from twenty-five to thirty fathoms. A good ground for haddock and cusk in the winter and spring, and resorted to by open boats, and also by many large vessels.

BOONE ISLAND ROCK GROUND begins one-half mile to the eastward of Boone Island Ledge, and runs in an east-southeast direction for a distance of two to three miles from the ledge, having a bottom of sharp rocks and clay, and depths ranging from forty to sixty fathoms. It is considered an excellent fishing-ground for cod, haddock, and cusk, and one of the best winter haddock grounds in the vicinity, at which season it is resorted to by the trawlers.

TEN ACRES bears south from Boone Island and east from the Isles of Shoals, these cross bearings meeting near the center of the ground, which is about five miles in diameter, with a small, rocky shoal (one-fourth mile wide) in the middle; on this shoal there is a depth of eighteen to twenty fathoms. The bottom around the shoal consists of clay and mud, and slopes gradually to depths of fifty to sixty fathoms near the edge. This is a good fishing-ground for cod, haddock, cusk, and pollock, while on the muddy bottom surrounding it large quantities of hake are taken.

In addition to the above-described grounds, there are in Well's Bay several small, rocky patches of less importance which are chiefly resorted to by small-boat fishermen.

7. THE COASTS OF NEW HAMPSHIRE AND MASSACHUSETTS TO NANTUCKET.

IPSWICH BAY.—Ipswich Bay, from the north side of Cape Ann to about Portsmouth, is resorted to during the winter season by large schools of cod, which visit this region to spawn. The shore soundings of the bay gradually deepen outwards from the land, reaching depths of thirty-five to forty fathoms at a distance of six to seven miles from shore. Within this limit, the bottom is mainly composed of sand, although there are numerous rocky patches between Newburyport and Cape Ann. Beyond a depth of forty fathoms, however, the bottom consists mostly of mud. The principal codfishing-grounds of Ipswich Bay lie off the northern shore, from Newburyport to the entrance of Portsmouth Harbor, at a distance of one and a half to five miles from the land, where the water is from twelve to twenty-five fathoms deep. Cod are also taken abundantly on the ledges at the south. A large fleet of vessels engage in this fishery in winter. Prior to 1880, trawls and hand-lines were universally used by the shore fleet, but in that year gill-nets were introduced with good results.

The area of muddy bottom outside is generally a favorite fishing-ground for hake in the late summer and fall. This fishery is participated in by the open-boat fishermen of eastern Cape Ann and the Isles of Shoals, and by small vessels coming from more distant places.

MASSACHUSETTS BAY.—The larger part of this bay, inside of Stellwagen's Bank, has a muddy bottom, on which large quantities of fish are rarely taken. Farther in, however, on the shore soundings, especially between the entrance to Boston Harbor and Plymouth, exist numerous rocky ledges, which are favorite feeding-grounds for cod in the fall and winter. This region is frequented by the Swampscott fleet and by other vessels supplying the Boston market. Near the center of Cape Cod Bay there is a rocky elevation, on which cod are taken, and numerous other ledges of larger and smaller size lie off the south side of Cape Ann.

Herring make their appearance about Cape Ann in the month of September. They come in large numbers, and remain about two weeks, the best fishing, however, continuing only about

one week. The school then moves slowly inward toward the head of the bay, the last fish being taken usually in the vicinity of Minot's Ledge, off Boston.

The mackerel, in the course of their autumn migrations after leaving the coast of Maine, pass in by Cape Ann and enter Massachusetts Bay, where they are generally taken in large quantities during October and November, by vessels of the regular mackerel fleet, using purse-seines.

GROUND IN THE VICINITY OF EASTERN POINT, CAPE ANN.—*Old Man's Pasture* bears southeast, distant five miles, from Eastern Point light. It is about three-fourths of a mile long, north-northeast and south-southwest, by one-third of a mile wide, the average depth of water being twenty-four fathoms; the bottom is rough and rocky. Cod occur here the entire year.

Western Part Ridge bears south by east half east from Eastern Point light; distance, about nine and one-fourth miles. The length, northeast and southwest, is one and one-half miles, and the average width three-fourths of a mile. The average depth is twenty-nine fathoms, the bottom being broken and rocky. Small vessels and open boats visit this ridge for cod and haddock in the summer.

Hart's Ground bears south half east from Eastern Point light; distance, five and one-half miles. Its length, in an east-northeast and west-southwest direction, is three-fourths of a mile, and its width one-fourth of a mile. This is a rocky patch with a depth of water of about thirty fathoms, and is visited by boat fishermen for haddock in the summer.

Eagle Ridge lies seven and two-thirds miles south by west from Eastern Point light, and is one mile long, southeast and northwest, by one-third of a mile wide. It has an average depth of twenty-five fathoms and an uneven rocky bottom, and is a favorite winter ground for cod.

Inside of the above-described grounds, at an average distance of two and one-half miles from Eastern Point light, and between the bearings of south half east and southwest, are a number of small rocky patches, with depths ranging from ten to twenty-five fathoms, designated as follows: *Brown's Ledge*, *Spot of Rocks*, *Stonewall*, *Saturday Night's Ledge*, and *Burnham's Rocks*. Still farther in are two other shoal spots, bearing nearly west from Eastern Point, one of which is distant about three-fourths of a mile, the other a little more than two miles. Each of these has a depth of about eleven fathoms, the former being called *Eleven-fathom Ground*, and the latter, which lies only half a mile southeast of Kettle Island, *Kettle Island Ledge*. Both of these patches are fished on by the boat and dory fishermen, using hand-lines, for cod in winter and for haddock in summer.

Numerous other rocky hummocks, of very limited extent, are located easterly of the grounds already described and within a few miles of them. They bear local names, and are less frequented than the larger areas, and the fishermen only reach them by means of cross-bearings from objects on land. The chief winter-grounds for cod in the vicinity of Eastern Point are *Old Man's Pasture*, *Eagle Ledge*, and *Brown's Ledge*.

STELLWAGEN'S BANK or MIDDLE BANK separates Massachusetts Bay from the Gulf of Maine, and extends from near Cape Ann to near Cape Cod. The center of the bank bears about south by east half east from Thatcher's Island, and north by west half west from Highland light, Cape Cod. The southern point of the bank is distant about five and one-half miles from Race Point, Cape Cod, and the northwest prong reaches to within about twelve to fifteen miles of Eastern Point, Cape Ann. The shoaler portion, with depths of from nine and one-half to nineteen fathoms, is seventeen and one-half miles long, in a north by west and south by east direction, and has an average width of four miles. This part of the bank is sandy, but on the eastern slope, in depths of twenty-five to fifty-five fathoms, it consists of coarse sand, gravel, and pebbles. On this

gravelly slope, for a number of years, haddock and cod were taken in abundance, the former in winter, the latter in fall and spring. The fishery was continued on a large scale until as late as 1875, and is even now carried on to a greater or less extent by the smaller vessels composing the coast fleet. The grounds off the southern end of the bank, and between it and Race Point, abound in cod in the fall and winter.

EAST SIDE OF CAPE COD.—The sea bottom off the east side of Cape Cod is sandy, and slopes off gradually from the beach, reaching depths of thirty to forty fathoms at distances of five to seven miles from land; below Chatham the slope is even more gradual. Within these limits good catches of cod are occasionally obtained, and the same is true of haddock, though to a less extent. Farther from shore, in depths of forty to eighty fathoms, and from a point eight to ten miles off the highlands of Cape Cod to another point lying twenty miles or more east-southeast of the Chatham lights, there is one continuous stretch of excellent winter haddock grounds, which were first generally fished upon about 1870. From that time until about four or five years ago, these grounds were much resorted to during the most of the winter months, and they still afford abundant catches to the vessels of the shore fleet.

MORRIS LEDGE, lying to the eastward of Chatham, is a favorite locality for certain codfishermen during the spring and early summer.

Two very excellent fishing-grounds for cod lie off the southeastern part of Cape Cod; one of these is situated close inshore; the other is an off-shore ledge. They are described as follows:

OUTER CRAB LEDGE.—The center of this ledge lies about fourteen miles east-southeast of Chatham lights; it extends about five or six miles in a north and south direction, and is about one mile broad. The depth of water ranges from nineteen to twenty-three fathoms; the bottom is rocky. Cod are more or less plentiful on this ledge during the entire year, but are fished for during the fall, winter, and spring, the same fishermen engaging mainly in bluefishing during the summer. The boats used are large cat-rigs, of twenty to thirty-five feet in length, and belong mostly to Chatham; a few also hail from Harwich. From seventy to eighty boats of this character may often be seen about this ledge at the same time. In former years, this ledge was frequented by large well smacks, of thirty to fifty tons burden, belonging to the south shore of Cape Cod. It is now occasionally resorted to by large Gloucester schooners.

POLLOCK RIP GROUNDS lie between Pollock Rip light-ship and Shovelful light-ship, and extend northward to Pollock Rip Shoal. The extent of these grounds is about three miles east and west and two miles north and south, the depths of water ranging from four to twelve fathoms. They are fished upon during the spring and fall by cat-rigged boats from Monomoy. In stormy weather Chatham boats also frequently resort to them, instead of going to Crab Ledge. Late in the spring and early in the fall, the cod move in nearer shore, and may be caught between Brush's shoal and Monomoy light. In the winter, however, the cod entirely leave Pollock Rip Grounds, and move into deeper water.

NANTUCKET SHOALS.—There are three principal codfishing-grounds included in these shoals. They are as follows:

Great Rip lies about thirteen miles east by south one-half south from Sankaty Head, Nantucket, and is about five miles long north and south, and three miles broad. Over this area the depths are only nine to eighteen feet, but fishing is mainly carried on around the edge of the shoal, in depths of six to twelve fathoms, where the bottom consists of gravel and shells, covered with sponges, kelp, etc. This region is visited mostly by well smacks from the ports of Long Island Sound, which fish more or less during the entire year, and carry their catch alive to New York. More fishing is done here during the winter and spring than at other seasons.

Fishing Rip is an elongate bank, situated about twenty-nine miles southeast from Sankaty Head light. It extends about ten miles in a northeast and southwest direction, and is about one and one-half miles broad; the depths of water upon it vary from four and three-quarters fathoms to eight and three-quarters fathoms. The character of the bottom is the same as upon Great Rip, and it is visited by the same fleet of fishing-vessels, and also occasionally by smacks from Nantucket.

Phelps' Bank lies about thirty-eight miles southeast one-half south of Sankaty Head light, and agrees more or less in size, shape, trend, and character of bottom with Fishing Rip. The depths of water range from ten to seventeen fathoms. It is resorted to occasionally by the same fleet of smacks that visit the two preceding banks.

Strong tidal currents flow over these three banks, the flood tide running northeast and the ebb southwest.

8. THE GULF OF MAINE.

The Gulf of Maine constitutes one of the most important fishing areas of the eastern coast of North America, both from the abundance of fish which resort to it and its close proximity to numerous large and enterprising fishing ports. It is nearly rectangular in shape, being bordered on the north and west by Maine, New Hampshire, and Massachusetts; on the south by George's Bank; and on the east by Nova Scotia, Brown's Bank, etc. Its greatest length is from Cape Cod to Cape Sable, the distance between these two points being about two hundred and fifteen miles. The average breadth at right angles to this line is about eighty miles. The area of the Gulf is, therefore, more than seventeen thousand square miles, all of which is more or less available for fishing of one kind or another. From the sixty-fathom line, which lies from twelve to twenty-five miles off the coast, the bottom descends rapidly in some parts, in others more gradually, to depths of one hundred to one hundred and sixty fathoms, nearly all the deeper tracts having a bottom of mud, on portions of which hake are sometimes abundant. To the north of the center of the Gulf, along a line running more or less directly from Cape Ann to the mouth of the Bay of Fundy, are distributed a number of elevated, gravelly, rocky patches of greater or less size, which are described below, and on which cod and haddock feed in immense numbers. These grounds are mainly visited by vessels of from fifteen to fifty tons, belonging to the New England fishing fleet. The mackerel fisheries of the Gulf of Maine are now the most important in the world. From the first of June to November, this species of fish is more abundant here than elsewhere along the coast, and the schools are distributed over the whole extent of the Gulf from the shores outward, irrespective of the depth of water. The shallow-water fishery is described elsewhere, but it is in the deeper waters, where the immense purse-seines can be freely used, that the large catches are made. Formerly, the Gulf of Saint Lawrence was most resorted to by the mackerel catchers of our ports, but since the introduction of purse-seines for the capture of this fish, the shallow waters of the Saint Lawrence have been largely deserted by the vessels of our fleet, which have been able to obtain much more profitable fares nearer home.

Herring also abound in the Gulf of Maine, where they used to be taken in gill-nets for use as bait by the fishermen at anchor on the cod grounds. This was at one time the principal method resorted to by the fishermen of the Gulf of Maine for securing bait, but now almost all the herring so used are obtained from the harbors and islands along the shore.

GRAND MANAN BANK.—Grand Manan Bank lies at the entrance to the Bay of Fundy, and bears southwest one-half south from the southwest head of Grand Manan Island, from which the northern part of the bank is fifteen miles distant. It is ten miles long and five miles wide, and

extends in a southwest and northeast direction. The bottom is mostly composed of stones and gravel, and the depths of water vary from twenty-four to forty-five fathoms. The tides are quite strong over this bank, but not sufficiently so to prevent trawling. Cod and pollock are the principal fish occurring here, cusk, hake, haddock, and halibut being less plentiful. The fishing season is from April to October, during which time the fish come on the bank to feed. In the spring, the fish are usually most abundant on the southwest portion, but later in the season the best fishing is generally obtained on the other end of the ground. This bank is a favorite fishing-ground for that class of small vessels known as the shore fishermen.

GERMAN BANK.—Although this bank is not usually laid down on the charts, it is one of the most important in the Bay of Fundy. It bears southeast from Baker's Island light, Mount Desert, from which the northwest part is about fifty-two miles distant. The length is about fifteen miles and the width nine to ten miles. It lies between $43^{\circ} 38'$ and $43^{\circ} 53'$ north latitude, and $66^{\circ} 58'$ and $67^{\circ} 15'$ west longitude. There are from sixty-five to one hundred fathoms of water. The bottom is mostly a tough red clay, but with spots of mud, sand, gravel, and pebbles on some parts. The tides set out and in over the bank, to and from the Bay of Fundy, the ebb running about southwest and the flood northeast, but the currents are not so strong as might be expected. Cod, hake, cusk, and haddock are the fish chiefly taken, but a few halibut and pollock are occasionally caught. The fishing season is from April to October, although fish are usually most abundant in the spring. This bank is mainly resorted to by vessels from the coast of Maine, but is sometimes visited by the Massachusetts fishermen.

MARBLEHEAD BANK.—This fishing-ground, which is quite an important one for the shore codfishermen, is not laid down on the published charts, and the fishermen who visit it are, therefore, probably the only persons familiar with its location and extent. The ground, which they call Marblehead Bank, is situated between Grand Manan and German Banks, the shoal water bearing south-southeast from Moos-a-Bec light, and being distant thirty-two miles. It is about twelve to fifteen miles long and seven or eight miles wide, and lies between $44^{\circ} 00'$ and $44^{\circ} 10'$ north latitude, and $66^{\circ} 58'$ and $67^{\circ} 13'$ west longitude. There are from thirty-five to seventy fathoms of water over it, and the bottom is mostly clay and gravel. The fish which occur in the greatest numbers are cod, pollock, and haddock, but with these are also found more or less hake and cusk. The best fishing is generally in the spring and early summer. The same class of vessels, the shore fishermen, which frequent Grand Manan and German Banks also resort to this bank, but occasionally those of a larger size make one or more trips to it during the summer season.

JONES' GROUND.—This is quite an important fishing-ground for cod, and, though of comparatively small size, is much resorted to by many of the same vessels that also visit the other banks in the Gulf of Maine. The western part bears southeast from Baker's Island, from which it is distant thirty-two miles. The entire ground is about ten to twelve miles long, northeast and southwest, and five miles wide. The depths range from fifty to one hundred fathoms, and the bottom, which is quite broken, consists of rocks, gravel, and mud. On the northeast part of the ground, where the depths vary from fifty to seventy fathoms, the bottom is rocky and rough. This part bears southeast by east, one-half east, from Baker's Island light, from which it is distant about thirty-five miles. The entire ground furnishes good trawl fishing from the first of May to the last of September. The principal fish taken are cod of large size; a smaller amount of hake, cusk, pollock, and haddock are also secured.

CLAY BANK bears southwest by west from Mount Desert Rock, from which the center is distant seven miles. It is four miles long, west-southwest and east-northeast, by two miles broad.

The depths are fifty to eighty fathoms, and the bottom consists of hard clay. The principal fish taken here are cod.

BANK COMFORT, which is a comparatively little known fishing-ground, bears southeast by south from Mount Desert Rock; distant thirteen miles. It is said to be about five miles long, southwest and northeast, by three miles wide; has a hard gravelly bottom, and depths ranging from seventy-five to eighty fathoms. It is considered an excellent fishing-ground for cod in the spring and summer, but is less frequented than some other localities, since its small size renders it difficult for the fishermen to find it, except under the most favorable circumstances.

JEFFREY'S BANK.—This bank, which lies east of Cashe's Ledge, is of comparatively little importance as a fishing-ground. It is about twenty miles long, southwest and northeast, and ten miles wide, the northern and southern limits being $43^{\circ} 30'$ and $43^{\circ} 15'$ north latitude. The eastern edge is in $68^{\circ} 25'$ and the western in $68^{\circ} 45'$ west longitude. The bottom, which is somewhat broken, is composed of mud, sand, gravel, and pebbles, the depths of water ranging from thirty-five to seventy fathoms. Cod, haddock, hake, and cusk are the most abundant fish; some pollock are caught, but halibut are rarely taken. The best season is late in the spring and early in the summer, before the schools of dogfish strike in, after which but few fish can be obtained. This bank is resorted to by the smaller-sized vessels, from fifteen to fifty tons.

NEWFOUND AND MONHEGAN FALL GROUNDS are evidently parts of Jeffrey's Bank, according to the statements of intelligent fishermen who have visited them. Newfound Ground is on the eastern part of the bank, and has a very irregular and broken bottom. Monhegan Fall Ground lies westerly from Newfound. Both of these grounds used to furnish excellent fishing, but are not now resorted to as much as formerly.

CASHE'S LEDGE.—This is not now a very important fishing-ground except for a brief period in the spring, although it is resorted to somewhat by the shore fishermen in summer and fall, when good trips are usually obtained. It bears east from Cape Ann, from which the shoaler portions are seventy-six miles distant. The bank is about twenty-two miles long, from $42^{\circ} 49'$ to $43^{\circ} 11'$ north latitude, and about seventeen miles wide, from $68^{\circ} 40'$ to $69^{\circ} 03'$ west longitude. There are three small shoals on the western part of the bank, the southern one with a depth of seven fathoms of water, the middle one with four fathoms, and the northern one with eleven fathoms. The position of the middle shoal is $42^{\circ} 56'$ north latitude and $68^{\circ} 52'$ west longitude. From this the south shoal bears south by east, and the north shoal north-northeast, each being three and one-half miles distant from it. The water breaks on these in rough weather, and though of small extent they are dangerous to passing vessels, especially as they lie almost directly in the track of vessels bound from Cape Sable to ports in Massachusetts Bay. With the exception of the shoals the depth of water ranges from fifteen to sixty fathoms. The ground is more or less broken, with a bottom of sand, pebbles, and rocks. The greater part of the fish caught here are cod, hake, and cusk. Halibut are rarely seen, and haddock and pollock are less plentiful than the other kinds. Good fares are often secured on the edge of the ground in May and June, but the dogfish, which appear about the last of June or in July, usually drive everything before them, and, for a time, stop the fishing. The vessels fishing on Cashe's Ledge range from fifteen to forty-five tons, and are classed as shore-trawlers.

FIPPENIES BANK bears east one-quarter south from Thatcher's Island; distance, sixty-one miles. It is nearly ten miles long north and south, and has an average width of four and one-half miles. The bottom consists of gravel, pebbles, and clay, the depths ranging from thirty-six to sixty fathoms. Resorted to by the shore fleet in the spring and early summer.

PLATT'S BANK, OR NEW LEDGE, bears east by north one-half north from Thatcher's Island, from which the shoal portion of the ledge is distant fifty-three miles. This bank is twelve miles long, southwest and northeast, and eight miles wide. The shoal, which is rocky and of small extent, is situated near the center, and has a depth of twenty-nine fathoms. Over a large extent of the bank the depths range from thirty to thirty-five fathoms, with a bottom of rocks and gravel. From the edge of this area the bottom slopes gradually to a depth of fifty to sixty fathoms; beyond which it drops suddenly to eighty or ninety fathoms with a muddy bottom. This is considered one of the very best fishing-grounds for cod and haddock in the Gulf of Maine, and hake are generally abundant during the summer on the muddy bottom near its edge. Trawl-lines are used. Resorted to by the shore fishing-vessels from all along the coast, from Cape Cod to Maine.

MISTAKEN LEDGE bears north from the center of New Ledge, from which it is distant about ten miles. This ground is about eight miles long in an east and west direction, and five miles wide. The depths range from thirty-five to sixty fathoms, and the bottom consists of rocks and gravel. In proportion to its size this ground is nearly as important as New Ledge, being resorted to by the same species of fish and visited by the same class of fishing vessels.

JEFFREY'S LEDGE.—This may be considered one of the best shore fishing-grounds in the Gulf of Maine, although it is of comparatively small size. It appears to be an extension of the shoal ground that makes off in a northeasterly direction from Cape Ann; it is about twenty miles long, northeast and southwest, and from two to four miles wide. Its southern limit is $42^{\circ} 54'$ and its northern $43^{\circ} 11'$ north latitude, and the eastern and western boundaries may be placed at $69^{\circ} 58'$ and $70^{\circ} 18'$ west longitude. The bottom is rocky on the shoalest parts, with gravel and pebbles along the edges. The depths of water range from twenty-seven to thirty-five fathoms on the bank, and fall off to forty and fifty fathoms at the edges. There is usually little or no tide, although an occasional current sets toward the southwest. Cod, cusk, and haddock are taken in the fall, winter, spring, and early summer, with a greater or less quantity of hake or pollock. For a number of years Jeffrey's Ledge was a favorite winter fishing-ground for haddock, which were very abundant there, and even at the present time many vessels resort to it in pursuit of that species; but since the haddock fishermen have extended their cruises to the outer banks, a less number now visit Jeffrey's Ledge. Besides the haddock catchers, other vessels engaged in the shore fisheries come to this ground in the spring and fall.

EASTERN SHOAL WATER OF CAPE ANN.—This ground extends off in an east-northeast direction from Cape Ann, a distance of fifteen to eighteen miles. It is, in reality, a southwest continuation of Jeffrey's Ledge, the two forming a nearly continuous ridge, running northeast from Cape Ann, a distance of about forty-two miles. The depths of water on the so-called "Eastern Shoal Water" vary from twenty to forty-five fathoms, the bottom consisting of rocks, pebbles, and coarse gravel over the most of its extent. On the edges sand and mud occur. The eastern part of this ground is resorted to by the haddock fleet during the fall and early winter, and the other parts are visited more or less the entire year, for cod, haddock, and pollock, by the vessels composing the shore fleet, and by the boat fishermen of Cape Ann.

TILLIE'S BANK bears east by south one-half south from Thatcher's Island, Cape Ann, from which the shoal (located near the center of the ground) is distant eighteen miles. A small, rocky shoal, with a depth of twenty-eight fathoms (some fishermen claim a less depth), is situated near the center, outside of which the water deepens to forty fathoms, this depth occupying quite an extended area. The length of the entire ground is ten miles, in an east and west direction, and

the width about five miles. At the edge it falls off rapidly to depths of fifty to sixty fathoms, before reaching the mud at a still greater depth. The bottom is rough and rocky over the greater part. Tillie's was formerly regarded as one of the best fishing-grounds off Cape Ann, and is still resorted to for cod and in the fall for haddock. Trawls are the principal kinds of fishing gear in use.

9. THE SOUTHERN COAST OF NEW ENGLAND.

THE SHORE GROUNDS OF NANTUCKET.

There are two principal shore grounds for cod on the coast of Nantucket; one lies off the eastern side of the island, the other off the southern. The eastern ground extends from off Siasconsett (north of Old Man's Shoal) northward to off Sankaty Head light, a distance of two miles, and off shore from three-fourths of a mile to two miles, with depths of four and one-half to eleven fathoms. The bottom is gravelly, with mussels and kelp. These grounds are fished on by about seventy dories during the spring and fall. The southern grounds extend westward from Tom Never's Head to Weedweeder Shoal, a distance of four miles, and off shore a distance of about one mile. Fishing is carried on in depths of eight to ten fathoms, on sandy and shelly bottoms, by about thirty dories belonging to Nantucket town, but quartering at the South Shore Life-Saving Station. Both cod and haddock are taken in the spring and fall. In the summer this is a good bluefishing-ground, and the fishery is carried on by means of gill-nets and hooks and lines.

NANTUCKET SOUND.

BISHOP AND CLARK'S LEDGE, near Hyannis, is a very rough bottom, with some exposed rocks, and is about one and three-fourths miles long and five-eighths of a mile wide. Fishing for tautog is carried on here, in depths of three to six fathoms, during the entire summer, or from June to October or November. This ledge is visited by large cat-rigged boats from Hyannis, which fish with hook and line. It is also a good ground for lobsters.

SOUTHWEST GROUND, HYANNIS, extends from the breakwater, off Hyannis, out to Bell Buoy, a distance of about two miles, and westward to Collier's Ledge, a distance of two and one-half miles, with depths of ten feet to four fathoms; the bottom consists of sand, gravel, and rocks, covered with algæ and eel-grass. During June this is considered the best sea-bass ground on the Massachusetts coast. Tautog, scup, and bluefish are also taken from June to October. This ground is frequented by cat-rigged boats from Hyannis, Centreville, and Cotuit.

OFF COTUIT, over an area about two miles square, and with an average depth of three fathoms, gill-net fishing for bluefish is extensively carried on during June and July. As many as three hundred or four hundred gill-nets are often set there at a time.

MUTTON SHOAL GROUND lies in the outer or southwestern part of Muskeget Channel, and extends about one mile south from Mutton Shoal, with a width of about the same. The depths range from three and three-fourths to four fathoms. Cod and haddock are taken in the spring and fall, and bluefish in the summer, the latter being fished for mainly in the rips at the side of the channel, with hooks and lines. This region is frequented by the so-called "Vineyard-fishing boats" hailing from Edgartown, Martha's Vineyard.

VINEYARD SOUND.

Vineyard Sound, from Hedge Fence Shoal, off East Chop, Martha's Vineyard, to east of Gay Head, constitutes one of the most extensive sea-bass grounds of the New England coast. Fishing is carried on everywhere throughout this region in depths of six to twelve fathoms, where the

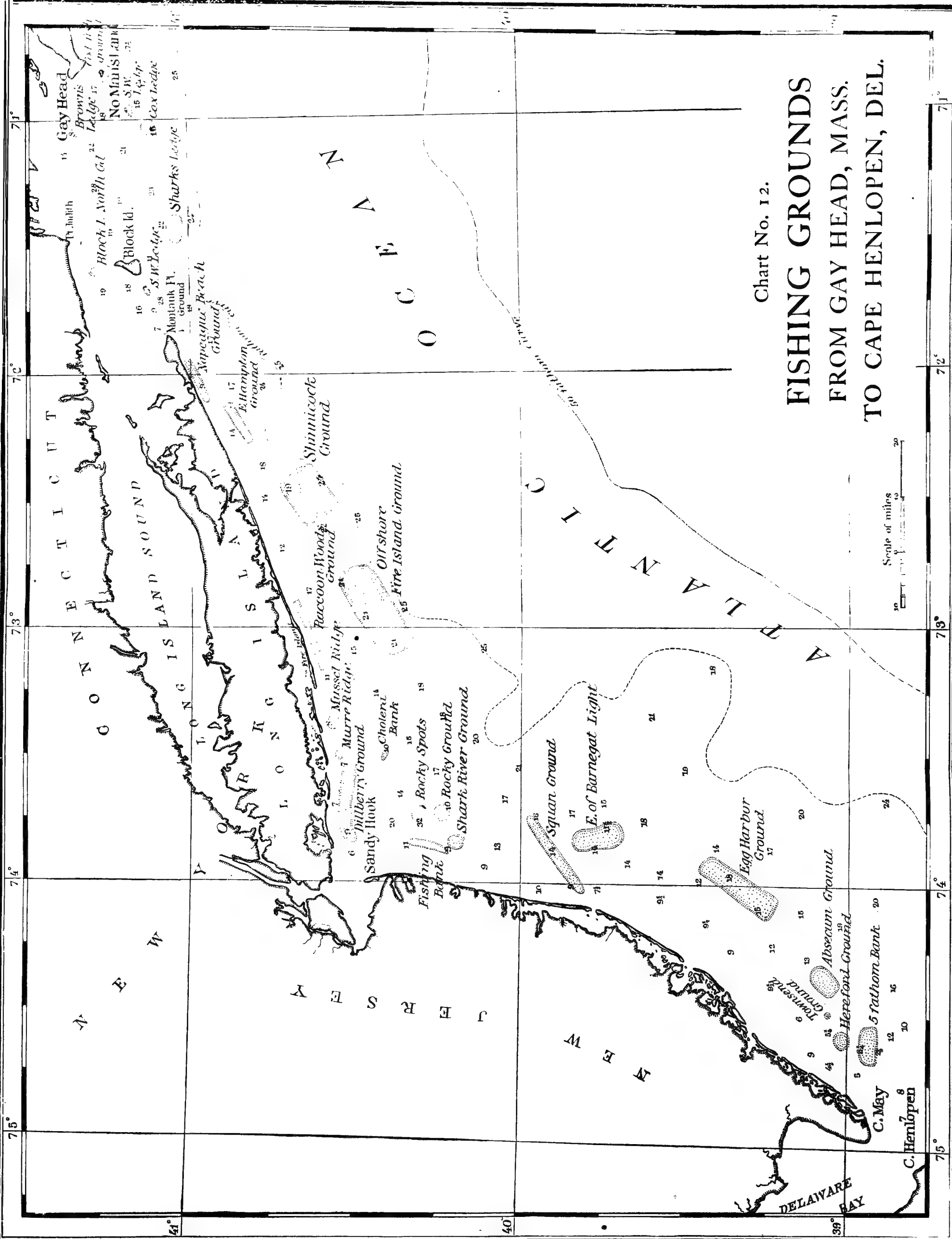


Chart No. 12.

FISHING GROUNDS

FROM GAY HEAD, MASS.

TO CAPE HENLOPEN, DEL.

Scale of miles
0 10 20

bottom is rocky, gravelly, or shelly. The fishing fleet consists of cat-rigged boats from Martha's Vineyard, Wood's Holl, and Falmouth, and well-smacks from New London and Noank, Connecticut, there being about fifty of the former class and thirty of the latter class regularly employed in this fishery. The season extends from the middle of June to the first of October; the boats shifting from place to place as the supply of fish becomes exhausted in each locality, and returning to the same ground at a later period. The well-smacks carry their catch directly to New York, but the fish taken by the smaller boats are shipped in barrels with ice.

Tautog are caught in small quantities along the western shore from Wood's Holl to Job's Neck, Naushon, a distance of about two miles, by the shore fishermen. They are also taken about Cuttyhunk through September and October, and likewise in November if the weather is moderate. The latter locality is considered to furnish the best tautog fishing of this region.

Lobster pots are set along both sides of the sound, from West Chop and Wood's Holl to Gay Head and Cuttyhunk, in depths of eight to fifteen fathoms. This was, in former times, a very valuable lobster region, and still remains so in its outer portions; but lobsters have become more and more scarce every year in the upper part of the sound, while they have apparently increased in abundance about Gay Head, Cuttyhunk, and No Man's Land. This fishery has, therefore, been mostly transferred to the outer grounds. The number of pots set in the sound during the past few years has varied from about 700 to 2,000 annually. Around Cuttyhunk about 900 pots are now in use. Very many pots are set just to the west and north of Gay Head, by parties residing temporarily at Menemsha Bight. Lobstering in the sound is confined to rocky and gravelly bottoms.

BUZZARD'S BAY.

The principal fishery of Buzzard's Bay is for tautog during the summer. Tautog appear at the head of the bay about May, and work into the shallow water farther out about a month later. The fishery is conducted on both sides of the bay, on rocky bottoms, in average depths of three fathoms, by a fleet of about twenty smacks from New Bedford and Westport, Massachusetts. Sea bass and scup are also taken during the summer months, but are not as abundant here as in Vineyard Sound.

OFF VINEYARD SOUND.

NO MAN'S LAND.—Cod are taken on all the rocky bottoms about this island during the fall and spring, and lobsters on all kinds of bottom during the spring and summer. The fall cod-fishery begins about the first of October, and continues until very stormy weather prevents the men from venturing out in their boats. About the first of April they begin to fish again for cod, and stop about the middle of May. The lobster season extends from the middle of May until about the twentieth of September. The bottom to the east and south of the island is sandy and gravelly; while to the west and north it is more or less the same, with numerous rocky patches. Codfishing is carried on from one-half to one and one-half miles from shore, in depths of four to ten fathoms, by about thirty boats using hand-lines only. The lobster pots are set from one-half to two miles from shore, in depths of ten to thirteen fathoms. There are from fifteen to twenty lobstermen fishing from here during the summer, using about one thousand pots. The catch for 1882 amounted to about one hundred thousand marketable lobsters. The fishermen of No Man's Land belong entirely to Martha's Vineyard, and live on the former island only during the fishing season; they use the "Vineyard fishing-boats." In addition to these, there are several well-smacks from New London and Noank, Connecticut, which visit this region more or less constantly during both the cod and lobster seasons, carrying their catch to New York.

SOUTHWEST LEDGE lies about thirteen miles southwest by south from Gay Head, Martha's Vineyard. It is oval in outline, extending about two miles east and west and one and one-fourth miles north and south. The depth of water is about fourteen or fifteen fathoms, and the bottom is rocky and gravelly. This is a very good cod ground, and is resorted to by New York smacks in the summer, and by schooners from New England in the spring, the former using hand-lines and the latter trawls.

COX'S LEDGE is a cod ground, the center of which lies about twenty-three miles southwest one-half west from Gay Head, Martha's Vineyard. It is elongate in shape, being four or five miles long, east and west, and about two miles wide. The depths of water range from fifteen to twenty-two fathoms. The bottom consists of rocks and gravel. Cod are found the entire year, and some haddock are also taken. This ground is frequented by eight or ten smacks from New Bedford and New London, and three large schooners from Fair Haven, Massachusetts, the former using hand-lines, the latter trawls. The smacks fish principally through the summer and the schooners through the early spring.

Several interesting small areas or "spots" about Cox's Ledge are known to the fishermen. They are of very limited extent, but are noted as furnishing excellent fishing. They are described as follows:

"Southwest Spot" lies about two miles southwest of the ledge. It has a hard bottom, and a depth of twenty fathoms. "West Spot" is about one-half mile west of the ledge, with the same character of bottom, and a depth of twenty-two fathoms. "Southeast Spot," situated about seven miles southeast of the ledge, has also the same bottom and a depth of eighteen fathoms. Other smaller and less defined spots occur in the same vicinity.

BROWN'S LEDGE lies six miles southwest by west from Sow and Pigs (Vineyard Sound) light-ship. It is about two miles square, and has a rocky bottom, with depths of seven to ten fathoms. Cod are taken here in the spring and fall, and tautog in the fall. This ground furnishes the last tautog of the season for this part of the coast. Fishing is carried on by smacks from New Bedford and Westport, Massachusetts. Some lobsters are caught on this ledge by Noank, Connecticut, smacks.

THE COAST OF RHODE ISLAND.

SHARK'S LEDGE bears southeast by south from Block Island light, nine miles to the center. Its length, east and west, is about five miles. This is a rocky ground, with about twenty fathoms of water, and is fished upon for cod and haddock during the winter, or from November to May or June, by New York smacks and Block Island boats using hand-lines. Fish are generally abundant.

There are numerous small, rocky patches, without names, but furnishing good cod and haddock fishing, situated to the south and southeast of Block Island, and between that island and Shark's Ledge. The season is the same as for the ledge. Fishing is carried on mainly by Block Island boats.

SOUTHWEST LEDGE OF BLOCK ISLAND.—The center of this ledge lies about three miles southwest by west one-half west from the southwest head of Block Island. It is about two miles long in a northeast and southwest direction, the inner edge being about two miles off the southwest head. The width of the ledge is about one-half mile; depth of water, five to nine fathoms; character of bottom, rocky. This is a good ground for cod and haddock from November to June. It is visited by New York smacks and Block Island boats.

NORTH GROUND OF BLOCK ISLAND lies about one and one-half miles north-northwest of the nun buoy, off the northern end of Block Island, and extends about one mile north and south, and one-half mile east and west. The bottom is rocky and broken. This is a good ground for cod in the spring, and is visited by the same class of boats that resort to Southwest Ledge.

O. NEW YORK TO SOUTHERN FLORIDA.

LONG ISLAND SOUND.

Good sea-bass grounds occur at numerous intervals along the northern side of Long Island, close inshore. Off the eastern side of Gardiner's Island there are many small, rocky spots, which abound in sea bass, and which the fishermen find by means of ranges on shore. Again, from off Brown's Hill, near Orient, to Horton's Point light, in Southold, there are a series of rocky spots, situated at irregular intervals close to the shore, where good sea-bass fishing is found. These spots are mostly eddies on either side of points or small headlands, and have depths of nine to twelve feet. They are of slight extent, seldom more than ten rods in diameter, and are resorted to by small boats from the neighboring shores, principally for pleasure, though to some extent as a regular business. The fishermen go one in a boat. Fleets of ten to fifteen of these boats often collect together on one of these grounds at a time. The most western sea-bass grounds of Long Island Sound are situated off Eaton's Point, near Huntington Bay, in twelve feet of water, with rocky bottom. Blackfish are also found here. Fishing is carried on in the same manner as to the east. The sea-bass season in Long Island Sound is from the middle of June to the last of September.

SCUP and small bluefish, called "snappers," are caught in most of the bays and harbors of Long Island Sound. The latter fish are most abundant in tide-ways. Both species are taken mainly in depths of one to three fathoms, on sandy bottoms, by pleasure parties, but are seldom sought after by professional fishermen.

THE OUTER SIDE OF LONG ISLAND.

MONTAUK POINT GROUND lies between Montauk Point, Long Island, and Great Eastern Rock, with depths of four to seven fathoms and a rocky bottom. This is a cod ground from April 1 to June 1, and is resorted to in the summer for sea bass. Fishing is done with hand-lines only.

NAPEAGUE BEACH GROUND is an inshore cod ground, extending from south of Montauk Point along Napeague Beach, a distance of about ten miles. Fishing is carried on from one-half to one and one-half miles off the beach, on sandy bottoms, in depths of three to eight fathoms, by New York smacks using trawls. The season lasts from the middle of April until the first of June.

EAST HAMPTON GROUND begins off East Hampton, at a distance of three to five miles from shore, and extends westward, parallel with the shore, a distance of eight miles. The bottom consists of sand; the depths range from fourteen to seventeen fathoms. The season and fishing boats are the same as for the last ground.

SHINNICOCK BAY GROUND begins off Shinnicock light, at distances of seven to fifteen miles from shore, and extends parallel with the shore, a distance of about ten miles, to off Moriche's Bay. The bottom is sandy and broken, with depths of sixteen to twenty-four fathoms. This is a winter cod ground, the season lasting from the first of January to May. Fishing is carried on by New York and New England smacks using trawls.

RACCOON WOODS GROUND lies close off Fire Island Beach, about one-fourth of a mile from land, and extends from off Raccoon Woods to Fire Island light, a distance of about seventeen miles. The bottom is sandy; depths, two to five fathoms. This is a spring and fall cod ground, and is visited by New York market smacks using trawls.

FIRE ISLAND OFF-SHORE GROUND.—The center of this ground bears about southeast from Fire Island light; distance, fifteen to eighteen miles. It is about five miles wide and from fifteen to eighteen miles long, extending nearly parallel with the neighboring Long Island shore. The depths range from sixteen to twenty-three fathoms; the bottom consists of sand and gravel, with sea weeds and sea clams. This is a winter cod ground for New York market smacks using trawls.

CHOLERA BANK lies about twelve miles south of Jones Inlet, and is about one mile long, east and west, and one-half mile wide. The bottom is rocky; depth, twelve fathoms. Fall ground for cod; visited by New York market smacks.

MUSSEL RIDGE is situated southeast of Jones Inlet, about one and one-half miles off the beach, and has depths of eight to ten fathoms, with a bottom of sand, mussels, and clams. This is a cod ground in the fall and spring; visited by New York market smacks and small sloops from Jones Inlet.

DILLBERRY GROUND extends westward, parallel with the shore, from three to five miles off Jones Inlet, to off Rockaway Inlet, a distance of fourteen to fifteen miles. The depths of water range from four to ten fathoms; the bottom is sandy, with some rocks. This is a boat fishing-ground for cod in the spring and fall, and some fishing is also done in the winter.

THE COAST OF NEW JERSEY.

ROCKY GROUND lies from twelve to fifteen miles southeast of Highland light, New Jersey, and is about three miles long, southeast and northwest, and one mile wide. Cod are occasionally taken here in the winter, but the principal fishery is for bluefish in the summer. This region is visited by the New York market smacks.

ROCKY SPOTS IN THE CHANNEL are located about eight miles south-southeast from Sandy Hook light-ship, in depths of twenty fathoms. This area is about three miles square, and is mainly valued as a bluefish ground.

FISHING BANK begins southeast of Highland light, about three miles from land, and extends south a distance of about eight miles. Depths, eight to twelve fathoms; bottom, sandy and rocky. This is a good ground for bluefish and sea bass in the summer.

SHARK RIVER GROUND.—The center of this ground bears southeast from Long Branch; distance, six miles. It is about three miles square, with depths of twelve to sixteen fathoms. Cod are found here in the winter and bluefish in the summer.

SQUAN GROUND begins about fifteen miles southeast of Squan, and runs to within five miles northeast of Barnegat light. It is located on the so-called twelve-fathom ridge, where the bottom consists mainly of sand, stones, and mussels. This is a winter ground for cod.

EAST OF BARNEGAT LIGHT.—The center of this ground lies from twelve to fifteen miles east of Barnegat light. It extends about seven or eight miles north and south, and is about three miles broad. The depths of water range from twelve to sixteen fathoms. The bottom is sandy and gravelly, with sea clams. A winter cod ground; visited by New York market smacks.

EGG HARBOR GROUND.—The center of this ground lies fifteen miles southeast of Egg Harbor light. The ground is about fifteen miles long and three miles broad, and extends parallel with the neighboring coast. Depths, twelve to fifteen fathoms; bottom, sandy, with algæ, sea clams, and mussels. A winter cod ground; resorted to by New York market smacks.

ABSECUM GROUND bears south of Absecum light fifteen to eighteen miles to the center of the ground. It extends about seven miles parallel with the coast, and is about four miles broad.

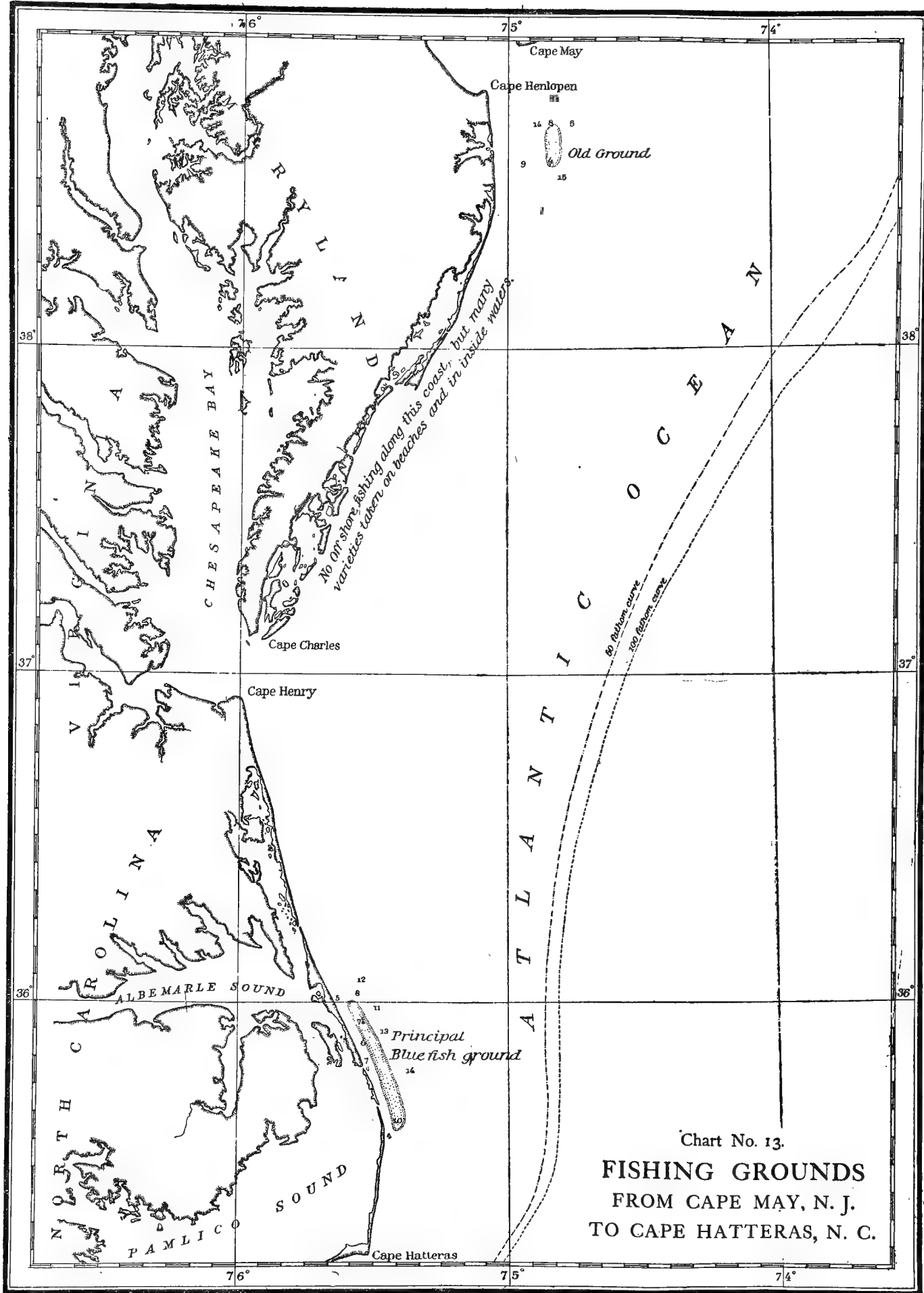


Chart No. 13.
FISHING GROUNDS
FROM CAPE MAY, N. J.
TO CAPE HATTERAS, N. C.

Depths, seven to fifteen fathoms; bottom, sandy and gravelly, with clams. A cod ground; visited by New York market smacks and sloops from Atlantic City using trawls.

TOWNSEND GROUND is a very small clay bank, situated about ten miles east-southeast of Townsend Inlet. It is about ten rods square, with a depth of ten fathoms. This is a good sea-bass ground in the summer; visited by New York market smacks.

HEREFORD GROUND lies about nine miles east of Hereford light. It is about four miles square, with sandy and rocky bottom, and depths of nine to ten fathoms. Sea-bass ground, of the same character as the last.

FIVE-FATHOM BANK lies mostly to the north and east of the buoy, located north of the Five-Fathom Bank light-ship. It extends five or six miles east of the buoy, and one or two miles west of it, and has a width of about three miles. This bank is a series of gullies, the depths ranging from three to ten fathoms, and the bottom consisting of sand, with many mussels. It is a winter cod ground; visited by the New York market smacks.

THE COAST OF DELAWARE.

OLD GROUND.—The cross-bearings to the center of this ground are given as follows: Cape Henlopen, bearing northwest, distant fifteen miles; Indian River, bearing west, distant ten miles. This ground is about eight miles long, north and south, and three miles broad; depths of water, nine to fourteen fathoms; bottom, rocky. It is one of the largest and oldest known grounds of this part of the coast, and the most extensive rocky bottom south of Montauk Point. Cod are taken here in the winter and sea bass in the summer by New York market smacks, and sea bass in the summer by Philadelphia pungies.

SAND-DITCH BAR bears northeast from Kit's Hammock Beach, from which the center is four miles distant, and is two miles long in an east and west direction by one-half mile wide. This is really an oyster-bed, having a depth of eight feet only at low tide, and is visited by local fishermen in summer, for weakfish and other species which frequent these waters.

SOUTHEAST BANK, which is similar to the last in character and in the varieties of fish taken, bears south-southeast from Kit's Hammock Beach; distance, five miles. It is eight miles long in a direction corresponding with the trend of the bay, and half a mile wide. The depth of water at low tide is twelve feet, and the bottom consists of blue clay.

THE COAST OF MARYLAND FROM ISLE OF WIGHT TO CHINCOTEAGUE INLET.

Along this stretch of coast no outside fishing-grounds, properly speaking, occur at any distance from the land; but menhaden, bluefish, and sea mullet are taken on the outer beaches with seines, and drumfish are caught in the same localities with hooks and lines. In the inner waters of Assateague, Sinepuxent, and Isle of Wight Bays quite an extensive seine and gill-net fishery is carried on for striped bass, perch, and various other species of fish.

THE EASTERN COAST OF VIRGINIA FROM CHINCOTEAGUE INLET TO HOG ISLAND.

This coast is low and sandy, with a very gradual slope out under the water, an average depth of seven to eight fathoms only being reached at a distance of five miles from the land. Over this section, however, within seven or eight miles of the land, there are quite a number of shoals, with depths of three and one-half to six fathoms, on which cod are said to occur in the winter. Hook and line fishing, in a small way for home supplies, is carried on in the creeks and inlets of this coast, where fish are plentiful enough to supply a much larger demand. This region also furnishes a good ground for seining menhaden in their season.

THE COAST FROM CAPE CHARLES, VIRGINIA, TO SOUTHERN FLORIDA.

The shores of this coast consist almost entirely of long, sandy beaches and a great number of low, marshy islands, separated by diffusely branching tide channels. These channels sometimes have a considerable width at high tide, but at low water are usually narrow, leaving broad flats exposed. Good fishing-grounds exist along almost the entire coast, but fish are now mostly taken on the sandy shores near the deeper holes and in the various inlets only in the vicinity of the larger towns and cities, as in such localities only can a market be found for the catch. Fish are more abundant in the inlets than on the outer shores. Mullet¹ are taken along the outer and inner shores of both North and South Carolina by fishing crews, who build temporary camps to last only during the fishing season. Bluefish are found along the entire coast, from Cape Cod to Southern Florida, and constitute one of the most important species south of Chesapeake Bay. There are two principal localities where bluefish are taken in gill-nets in the late fall and winter. One of these is situated off Cape May, in the vicinity of Five Fathom Bank. The other is on the coast of North Carolina, beginning a few miles below Cape Henry and extending to Cape Hatteras Inlet.

VICINITY OF CAPE LOOKOUT.—On the south side of Cape Lookout, and within a short distance of the beach, mullet, Spanish mackerel, drum, and sheep's-head abound, and toward the end of the cape large quantities of menhaden are seined. In this vicinity, a fishery for porpoises and whales is also carried on, usually at a short distance from the shore, by means of small boats. In the sound, inside of the outer beach, mullet and several other species of small fish are common in their season.

BEAUFORT HARBOR, NORTH CAROLINA.—At and off the entrance to this harbor there are good bluefishing-grounds in summer. To the eastward of the entrance, along the beach of Shackleford Banks, "sea trout" are seined for in the spring and fall, and drum and mackerel are caught in the fall. Inside of these banks sea trout, sheep's-head, hogfish, and spots are also taken in the fall. West of the entrance, along the outer shore of Bogue's Banks, for a distance of

¹ The scientific names of the several species of fish referred to on pages 52 to 55 are as follows:

Bass	<i>Sciaenops ocellatus.</i>
Bastard Snapper	<i>Rhomboplites aurorubens.</i>
Black Grunt	<i>Hæmulon formosum.</i>
Blackfish or Sea Bass	<i>Centropristis atrarius.</i>
Bluefish	<i>Pomatomus saltatrix.</i>
Butter-fish	<i>Stromateus alpidotus.</i>
Cobia	<i>Elacate atlantica.</i>
Drum	<i>Pogonias chromis.</i>
Grunts	<i>Hæmulon</i> (various species).
Hogfish	<i>Pomodasys fulvornaculatus.</i>
Jack	<i>Caranx hippos</i> , and other carangoids; the name is also applied to the Pompano.
Menhaden	<i>Brevoortia tyrannus.</i>
Mullet	<i>Mugil brasiliensis</i> and <i>M. albula.</i>
Porgees	<i>Stenotomus aculeatus</i> , &c.
Red Snapper	<i>Lutjanus Blackfordii.</i>
Sailor's-Choice	<i>Lagodon rhomboides.</i>
Sea-trout	<i>Cynoscion maculatum.</i>
Sheep's-head	<i>Archosargus probatocephalus.</i>
Spanish Mackerel	<i>Scomberomorus maculatus.</i>
Spot	<i>Liostomus obliquus.</i>
Spotted Bass. (See Bass.)	
Squirrel-fish	<i>Diplectrum fasciculare.</i>
Tautog	<i>Tautoga onitis.</i>
Tom-coâ or Kingfish	<i>Menticirrus nebulosus.</i>

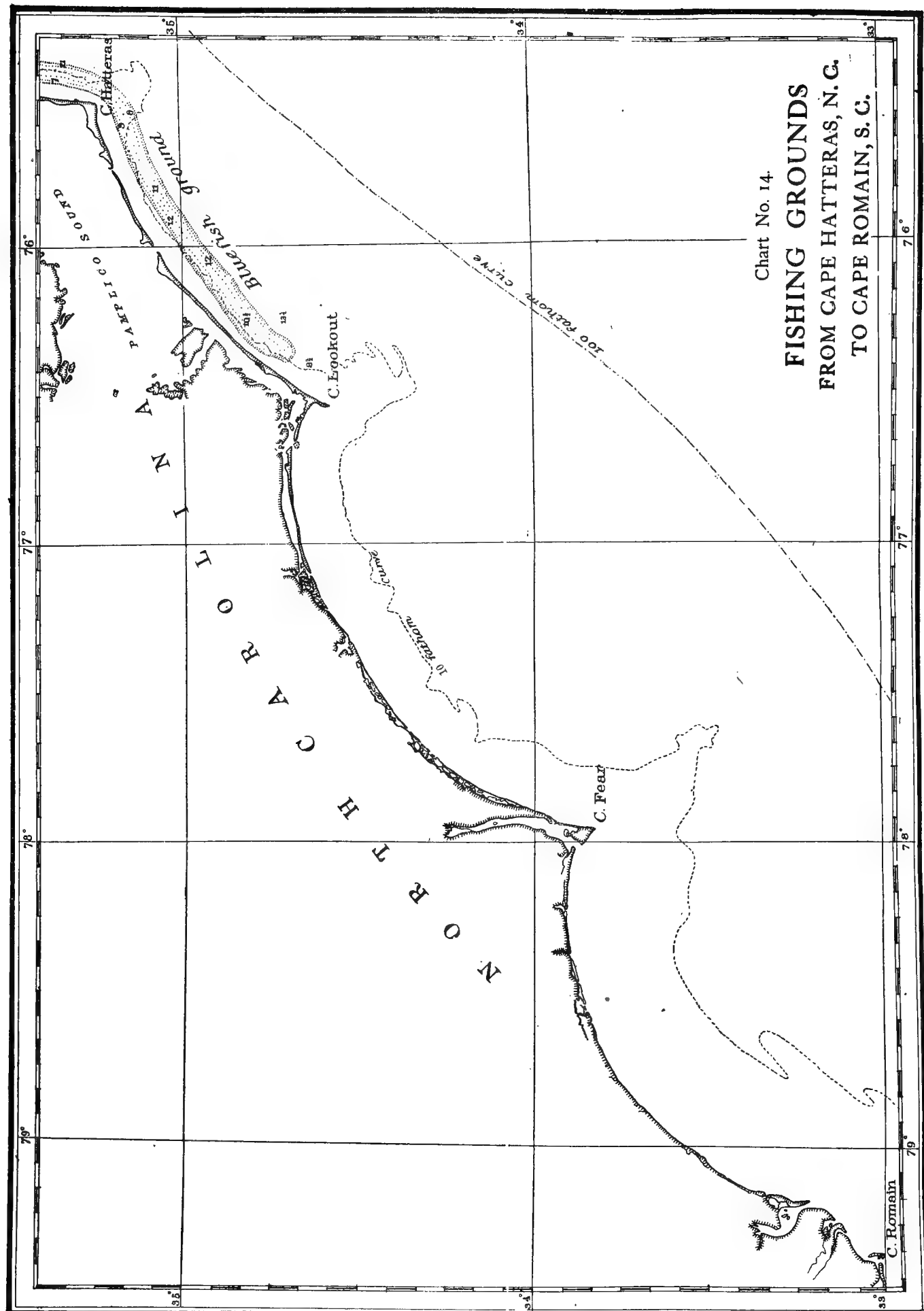
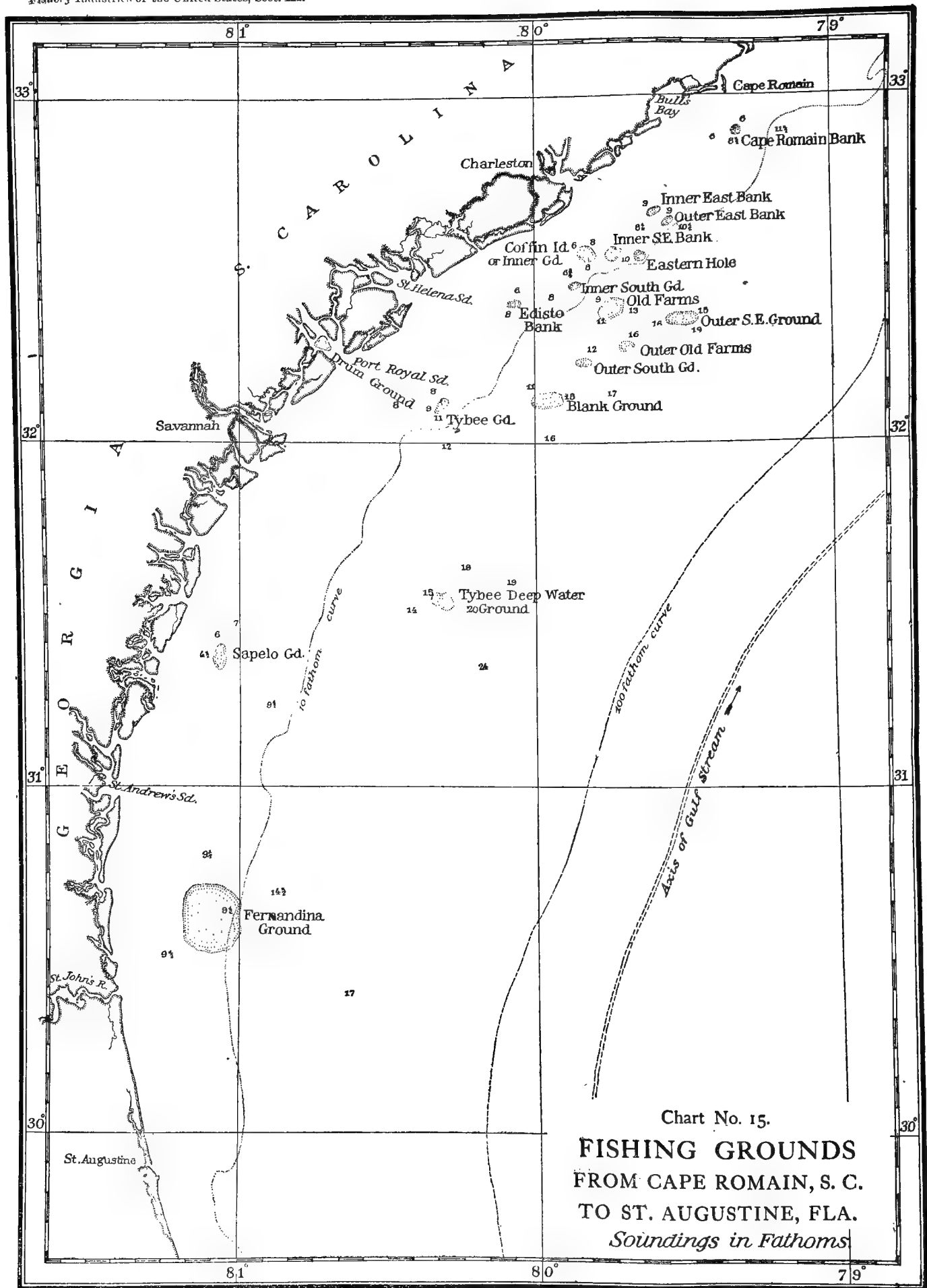


Chart No. 14.

FISHING GROUNDS FROM CAPE HATTERAS, N. C. TO CAPE ROMAIN, S. C.



two miles or more from Fort Macon, sea trout are taken in seines in the spring and summer. Inside of Fort Macon they are taken in the fall. Farther west, off the beach, whale-fishing is carried on by small boats from the shore.

VICINITY OF CAPE FEAR, NORTH CAROLINA.—At the entrance to Wilmington River, near Fort Caswell, and along the beach south of the fort, a distance of twelve to fifteen miles, mullet are taken in the fall in haul-seines. North of Cape Fear, along the outer beach and in the waters inside, mullet, sea trout, and several other species of fish abound in their season and are fished for with gill-nets and seines.

VICINITY OF CHARLESTON, SOUTH CAROLINA.—All along the shore, a distance of ten to fifteen miles on both sides of the entrance to Charleston Harbor, mullet seining is extensively carried on in the fall.

THE OFF-SHORE FISHING-GROUNDS OF SOUTH CAROLINA AND GEORGIA.¹

CAPE ROMAIN BANK.—This is a small, rocky patch, about half a mile square, situated eight miles south-southeast from Cape Romain light, and four miles south by west from the outer shoal buoy. It has a depth of eight fathoms, the bottom consisting of lime rock and gravel with willow corals (Gorgonians) growing upon it. Fish are caught on this ground from June to October, the following varieties being taken, namely: Sea bass, porgees, grunts, bluefish, sharks, a few sailor's-choice, and in October spotted bass which often weigh from thirty to forty pounds each.

INNER EAST BANK bears southeast by east from Charleston light-ship; distance, eight miles. It extends one mile east and west and one-half mile north and south, and has a depth of seven and one-half fathoms. It is frequented by smacks and small boats, the smacks going there from June to December, and the small boats only from June to September. The fishing is done with hooks and lines, and the following kinds of fish are caught: blackfish, porgees, jacks (abundant), and flounders.

OUTER EAST BANK bears southeast by east from Charleston light-ship; distance, eleven miles. It extends one mile east and west and one-half mile north and south, and has eight and one-half to ten fathoms of water upon it, the bottom consisting of coral rock, and yellow sand. The same smacks and boats fish on this bank that visit the Inner East Bank, the season being the same and also the species of fish taken.

EASTERN HOLE bears southeast by east fifteen miles from Charleston light. It is about a mile in diameter, with a depth of twelve fathoms, and a bottom of lime rock, sand, and willow corals. It is fished on by smacks only, from October to April. Sea bass are the fish chiefly caught in the day-time, but at night tom-cod, butterfish, tautog, and a few flounders are also taken.

OUTER SOUTHEAST GROUND bears southeast twenty-seven and one-half miles from Charleston light, and extends five miles east and west and two miles north and south. The bottom is mostly coral rock, with many purple willow corals (Gorgonians). The south side of the ground is covered with large red shells, the east side with bright white sand and white sand mixed with black specks, the west side with shells and sand. The smacks fish here from November to April and May, the catch consisting of sea bass, bastard snappers, red snappers, and jacks.

INNER SOUTHEAST BANK bears southeast ten miles from Charleston light, and extends two and one-half miles east and west and one and one half miles north and south. It has about ten

¹ Frequented by the smack and boat fishermen running to the Charleston markets and elsewhere on that coast.

fathoms of water and a coral bottom. This is a summer fishing-ground, and small boats and smacks visit it from May until August. Porgees, blackfish, red-mouth grunts, black grunts, tautog, sailor's-choice, and cobias are taken. Porgees school here abundantly in August, and about three hundred is considered a fair day's catch; these weigh from three-fourths of a pound to one pound each, and are tied in bunches of five each for sale. The average daily catch of blackfish is two hundred and fifty; of grunts three hundred; but only a few tautog, black grunts, and sailor's-choice are taken. Cobias come in May and remain until July; they drive all other fish away from these grounds. The average daily catch of this species to a man is three.

COFFIN LAND GROUND or INNER GROUND bears south-southeast eight miles from Charleston light, and is three miles long east and west by two and one-half miles wide north and south. The bottom is of coral rock and the depth seven to nine fathoms. Smacks and boats fish on this ground with hooks and lines (the only method pursued on these grounds) principally from April to December. Jacks are caught from April to August, porgees from July to October, and blackfish and sea bass from the first of October to the first of December. The average daily catch to a man of all kinds is about four hundred fish.

OLD FARMS GROUND bears south-southeast eighteen miles from Charleston light; is five miles long east and west by three miles wide north and south, and has a depth of twelve to seventeen fathoms, with a bottom of coral and broken shells. This is a winter fishing-ground and only smacks resort to it. Sea bass, red snappers, and bastard snappers are the principal fish taken from October to April, but, besides these, a few tautog, black grunts, and red-mouthed grunts are caught. The bait used on this and other grounds in the vicinity is blackfish, shark, and squid. The former is the best. The daily catch of fish to a man is about three hundred.

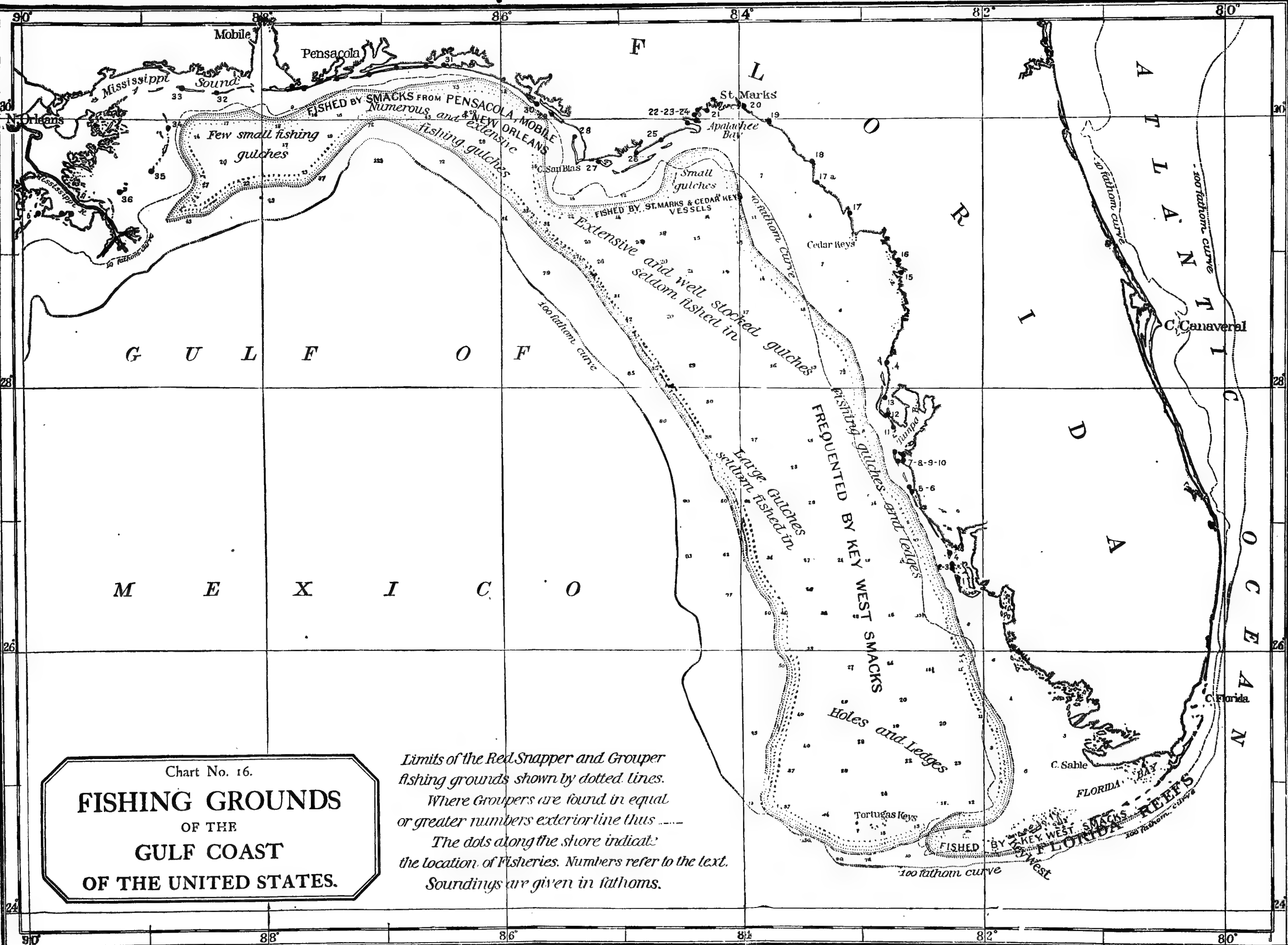
OUTER OLD FARMS GROUND bears south-southeast twenty-five miles from Charleston light, and is three miles long east and west by one and one-half miles wide north and south. The bottom is of coral rock with "willows," and the depth seventeen fathoms. This is also a winter ground for the same kinds of fish that are caught on the Old Farms, and fishing is carried on from October to April.

INNER SOUTH GROUND bears south one-half east from Charleston light; distance, fifteen miles. Its length is one and one-half miles east and west, and its width one-half mile north and south. It has twelve fathoms of water, and an uneven bottom of coral rock and yellow "willows." This is a winter ground, resorted to by smacks only, from December until April. Blackfish, bastard snappers, red snappers, black grunts, porgees, and occasionally sharks, nursefish, and squirrel fish are taken. Bastard snappers are the most plentiful, while the other kinds are generally scarce.

OUTER SOUTH GROUND bears south one-half east, twenty-seven and one-half miles, from Charleston light, and extends two miles east and west and three-fourths of a mile north and south. The depth of water is fourteen and one-half fathoms, and the bottom consists of coral rocks, yellow "willows," and sponges. It is a winter ground, fished on from December to April. The same kinds of fish occur upon it as upon the Inner South Ground.

EDISTO BANK bears southeast by south eleven miles from Edisto Harbor. It is one mile long east and west by one-fourth of a mile wide, and has a depth of eight to ten fathoms. The bottom consists of rocks and shells and on the north side of red sand. Smacks fish here from April to October. The fish taken are sea bass, porgees, red-mouthed grunts, a few jacks, and occasionally a cobia. Sharks (puppy sharks) are so plentiful in June as to stop fishing.

BLANK GROUND bears southwest one-half south eight or nine miles from Outer South Ground, and extends four or five miles east and west and two miles north and south. It has



fourteen fathoms of water; and the bottom consists mostly of "willows," with some other corals. Fishing is best in January.

TYBEE GROUND bears east one-half north twelve to fourteen miles from Martin's Industry light-ship. It is one and one-half miles long southeast and northwest, and one-half mile wide. The bottom consists of shells and corals, the depth being nine to nine and one-half fathoms. This ground is resorted to by the smacks, from August to January, for blackfish and trout, which are taken to the Charleston market, fifty miles distant.

TYBEE DEEP WATER GROUND bears southeast forty miles from Tybee light-house, and is three miles long northwest and southeast by two miles wide. The bottom consists of corals, "willows," fine sand, and shells, and the depths range from fifteen to eighteen fathoms. Smacks fish here from January to March for blackfish and snappers.

SAPELO GROUND bears east by north from Wolf Island, from which it is ten miles distant. It is four miles long north and south and one mile wide. The bottom consists of corals and shells, and the depth is nine to ten fathoms. Smacks fish here for blackfish and snappers for the Charleston and Savannah markets, from June to January.

FERNANDINA GROUND bears from east-southeast to east by north from Fernandina light-house; distance, fifteen miles. This is a nearly circular ground from seven to ten miles in diameter. The bottom is of corals and is generally broken, the average depth being seventeen fathoms. It is fished on in the winter season for blackfish and other species.

11. THE GULF OF MEXICO.

THE FISHING-GROUNDS OF THE GULF OF MEXICO BELONGING TO THE UNITED STATES.

BY SILAS STEARNS.

The southern and easternmost of the fishing-grounds of the Gulf coast are those of the Florida Reefs, which are mainly visited by the Key West market fleet.

These reefs, as a natural consequence of their coral formation and the protection afforded by their uneven surfaces, are exceedingly well populated with all the forms of invertebrate animals common to this latitude, and, therefore, we find about them an abundance of fishes, attracted by the vast stores of food. On the Gulf Stream side of the keys all forms of animal life exist in greater abundance than on the opposite side, owing probably to the greater depth, clearness, and warmth of the water. In the narrow channels through the reefs, and about solitary rocks and clusters of rocks the best fishing-grounds usually exist, but the kind of fish sought for has much to do with this, for some kinds swim in open water in search of prey, and others along the bottoms of channels, while others again obtain their food from the sides of high-standing rocks and in shoal water.

During warm weather fish abound both outside and inside of the Reef to the south shore of the keys, but during cold "northers," when much of the cold water from Florida Bay is driven through between, and to the south of, the keys, the majority of the fish retreat to the outer side of the Reef, where they can be in the warm water of the Gulf Stream. This movement is particularly noticeable with the kingfish (*Scomberomorus regalis*), and it is during such cold spells that the largest catches of this species are made, for they are then congregated within narrow limits. The kinds of fish commonly taken on these grounds are as follows:

Carangus hippos. Jackfish.

Enneacentrus punctatus. Coney.

Paratractus pisquetus. Horse-eye Jack.

Sarothrodus bimaculatus. White Angel-fish.

Decapterus punctatus.

Holacanthus ciliaris. Yellow Angel-fish.

<i>Seriola punctatus</i> . Amber-fish.	<i>Holacanthus tricolor</i> . Black Angel-fish.
<i>Hæmulon punctatus</i> . White Grunt, Yellow Grunt, Black Grunt.	<i>Sparus pagrus</i> . Porgée, Margate fish, Goat's-head Porgée, Sheep's-head Porgée.
<i>Lutjanus caxis</i> . Gray Snapper.	<i>Scomberomorus regalis</i> . Kingfish or Cero.
<i>Lutjanus Blackfordii</i> . Red Snapper.	<i>Scomberomorus maculatus</i> . Spanish Mackerel.
<i>Lutjanus Stearnsii</i> . Mangrove Snapper.	<i>Scomberomorus caballa</i> . Kingfish or Cero.
<i>Mesoprion uninotatus</i> (?). Schoolmaster Snapper.	<i>Sphyræna picuda</i> (?). Barracuda.
<i>Ocyurus chrysurus</i> . Yellow-tail Snapper.	<i>Lagodon rhomboides</i> . Sailor's-Choice.
<i>Trisotropis brunneus</i> . Black Grouper.	<i>Lachnolæmus falcatus</i> . Hogfish.
<i>Trisotropis falcatus</i> . Grouper.	<i>Sciænops ocellatus</i> . Channel Bass.
<i>Trisotropis undulosus</i> . Rockfish.	<i>Centropristis atrarius</i> . Sea Bass.
<i>Epinephelus morio</i> . Red Grouper.	<i>Balistes capriscus</i> . Turbot.
<i>Epinephelus striatus</i> . Nassau Grouper.	<i>Pomatomus saltatrix</i> . Bluefish.
<i>Epinephelus nigritus</i> . Jew-fish.	<i>Menticirrus alburnus</i> . Whiting.
<i>Epinephelus Drummond-Hayi</i> . Deer Grouper, Hind.	<i>Cyphosus Boscii</i> . Brim.

Proceeding northward in the Gulf from the Florida Reefs fishing-grounds, we find innumerable places for sea-fishing, which follow one another so continuously from the Tortugas Keys to the mouth of the Mississippi River, that the entire region can be best described as an extensive fishing-ground in the form of a broad belt following the general contour of the coast.

The character of the southern portion of these grounds, from about the latitude of Anclote Keys southward, is different from that of the northern portion in some respects. The bottom at the south seems to consist of a more recent formation than at the north; there is less sand and mud, and fish occur near to and among the ledges which stand up from the deposit of sand and shells.

Along the coast from Anclote Keys to Charlotte Harbor there exist extensive and continuous lines of ledges, upon which, as well as in the gullies between, fish abound. The same kind of bottom is again found just north of the Florida Reefs, but between the two regions there is an almost barren waste of sand.

The fishing-grounds on the off-shore limit of this section are, so far as known, in the gullies between the rocks where there are living corals, or else in gullies in sandy and shelly bottoms also containing living corals and a soft rock formation.

The grounds of the northern portion, embracing the region between Anclote Keys and the mouth of the Mississippi River, are wholly in gullies. The bottom off to a depth of about twenty fathoms generally consists of sand with an admixture of broken shells, but in the gullies, which vary from one hundred to one thousand yards in width and from one-fourth of a mile to several miles in length, the bottom is covered with living and dead corals or hard rock. Outside of about twenty fathoms, rocky and coral bottom predominates, and the soundings show it to be very uneven. At some places in this northern portion the small gullies or gulches are found quite near to the coast, as, for instance, off Appalachee Bay, Dog Island, and Crooked Island, off the coast between Saint Andrew's and Choctawhatchee Bays, and off Pensacola, where they occur in from five to ten fathoms of water.

The deepest waters in which fishing is carried on in the Gulf of Mexico are off Pensacola, in a southeast direction and in a depth of nearly fifty fathoms.

Just east of the Mississippi River and off Mississippi Sound there are a few small gulches inshore, which were formerly resorted to, but are not fished on now.

The general character of the bottom in this section is muddy, and it is possible that the

sediment from the Mississippi River is filling up the fishing-holes near by. West of the Mississippi, off the coasts of Louisiana and Texas, the bottom is also muddy. Several fishing schooners from Pensacola have carefully explored this region and have found but two or three small patches of hard bottom. These yielded a few fares of red snappers and were left for the time as almost barren. Since they are in shoal water (10 to 20 fathoms) it is probable that they are inhabited only in summer when the water is warm, and even then only to a slight extent.

On the grounds of the southern portion or district, as I have classed it, the majority of the edible fish taken are groupers, chiefly the red and black groupers (*Epinephelus morio* and *Trisotrops brunneus*) while the red snappers are much less abundant. On the northern grounds it is just the opposite, red snappers being more numerous and groupers much less common. Other kinds of fish are often caught, many of which are not salable. The most common of these are as follows, those marked with an asterisk not being eaten :

Balistes caprisus. Leather Jacket or Turbot.*

Epinephelus Drummond-Hayi. Hind.

Epinephelus nigrilus. Jew-fish, Warsaw.

Echeneis naucrateoides. Suckerfish.*

Lutjanus Stearnsii. Mangrove Snapper.

Sparus pagrus. Porgree.

Centropristis atrarius. Sea Bass.

Rhomboplites aurorubens. Bastard Snapper.

Lagocephalus lævigatus. Bottle-fish.*

Sciaenops ocellatus. Channel Bass, Redfish.

Batrachus taupardus. Sea Robin.*

Seriola bonariensis. Rock Salmon.

Seriola Stearnsii. Amber-fish.

Trisotrops falcatus. Scamp.

Several species of sharks.*

The off-shore fishing-grounds, off Cedar Keys, where red-snappers, groupers, and such fishes can be caught, lie over thirty miles in a westerly direction from Cedar Keys. From there, by following the deepest water on a southeast or a northwest course, fish are found in abundance, until shoal water is reached, either off Tampa Bay or off Cape Saint George. On these banks groupers, especially the red grouper, are found in greater abundance than to the westward, any where between Cape Saint George and the Mississippi River; and, on an average, two-thirds of the catch will be groupers and one-third snappers. On the bottom there is a greater deposit of lime rocks, and probably more living corals, etc., than in the Pensacola Bight, which explains the causes of their abundance.

Along the entire coast there is a tendency among these fishes to move from the shoaler water to off-shore grounds at the approach of cold weather. During mild winters they remain inshore, but during severe seasons they are not to be found there.

The fishermen prefer to take fish from shoal water, as it is less laborious than deep-water fishing, and the fish taken there are much hardier and better able to bear transportation alive in vessels' wells than those from very deep water. The consequence is that the grounds of the deep-water regions are not much explored, and it is probable that the most important store of food-fishes of the Gulf has not yet been drawn upon.

The seining flats are smooth sand-bars lying in the thoroughfares of schooling fishes, and conveniently located for drawing the seines ashore. Such places are not common along the coasts of

southwestern Florida, and of Louisiana and Texas, where the shores are mainly uneven and marshy, but where they do occur fishing establishments are formed each season. In the regions most convenient to markets nearly all the favorable seining flats have been secured by fishermen or fishing firms, who build permanent houses and wharves for the prosecution of their business.

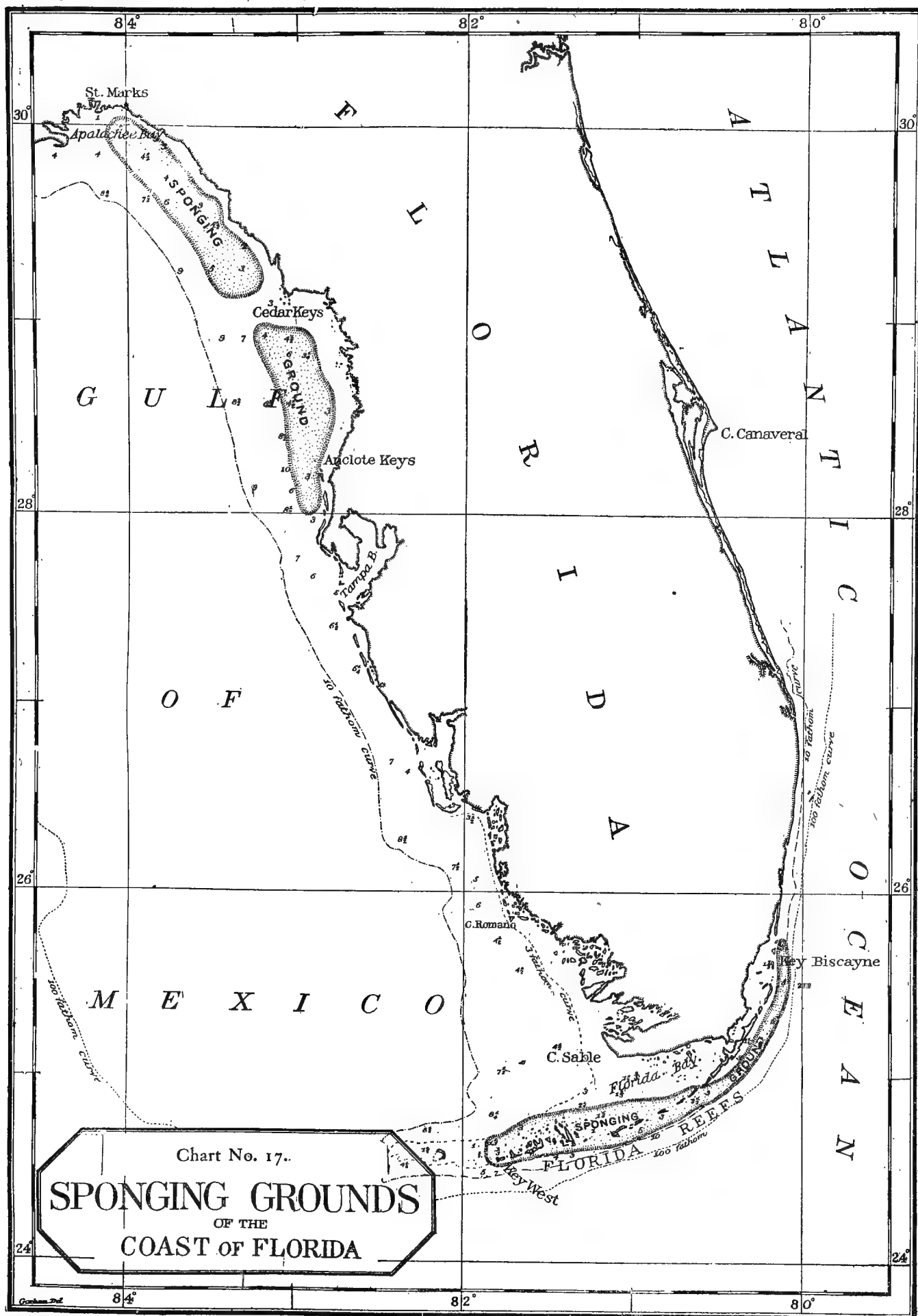
At other and more remote points, temporary shanties, generally constructed from palmetto leaves, are built, which are occupied one year by one crew and the next year by another, according to whichever reaches the locality first. Those nearest the markets are the most used and have the most elaborate and complete outfits. Probably in the course of a few years all suitable sites will have been secured. Usually they occur near the entrances to bays or rivers, or on islands or projecting points of land—places where schools of fishes coming from, or going to the sea, must approach near the shore.

The region from Appalachee Bay to the mouth of the Mississippi River has an almost unbroken shore that is suitable for seining. As a result, there are few permanent stations, and the fishing is carried on from small vessels and boats that accommodate the crew and their catch while on short trips from the nearest markets.

THE FLORIDA SPONGE GROUNDS.

The Florida sponging-grounds form three separate and elongate stretches along the southern and western coasts of the State. The first includes nearly all the Florida Reefs; the second extends from Anclote Keys to Cedar Keys, and the third from just north of Cedar Keys to Saint Mark's, in Appalachee Bay. The Florida Reef grounds have a linear extent of about one hundred and twenty miles, beginning near Key Biscayne, in the northeast, and ending in the south, at Northwest Channel, just west of Key West. The northeastern half of the grounds are very narrow, having an average width of only about five miles, and being limited to the outer side of the reefs. At about the Matacumbe Keys the grounds broaden out so as to cover the entire width of the reefs, which are much broader here than at the north. The entire southern half of the grounds have more or less the same breadth, which is about thirteen or fourteen miles. The second sponge-ground begins just south of Anclote Keys, with a breadth of seven or eight miles, but rapidly broadens out toward the north to a width of fifteen miles, which it maintains from a point about opposite Bay Port to Sea Horse Reef, just south of Cedar Keys. The total length of this sponging-ground is about sixty geographical miles. Its distance from the shore varies somewhat; at the south the inner edge approaches within four or five miles of the mainland, and comes close upon Anclote Keys; but throughout the remainder of its extent it is distant from six to eight miles from the shore, until it touches the shallow bottom and reefs of Cedar Keys. The depth of water on these grounds, as indicated on the Coast Survey charts, ranges from three to six fathoms, but many portions are undoubtedly shallower than this. The northern sponging-ground, which maintains a nearly uniform width throughout, is about seventy miles long by about fifteen miles broad. It approaches to within about five miles of the shore, and terminates just off the mouth of Saint Mark's River. The depth of the water upon these grounds is the same as upon the next one to the south—from three to five fathoms.

The total area of the Florida sponging-grounds, which are now being worked upon, including also those which were formerly fished but have since been more or less abandoned, may be roughly stated at about three thousand square geographical miles. This does not, however, probably indicate the entire extent of the sponging-grounds of the Florida waters, for the fact that new grounds are being constantly discovered would indicate that there might still be more to find, and it is certain that no very strenuous efforts have yet been made to extend the already known grounds, the discovery of new sections generally having been made by accident.



LIST OF THE FISHING-STATIONS ON THE GULF COAST OF THE UNITED STATES.

BY SILAS STEARNS.

[The numbers refer to the chart prepared by Mr. Silas Stearns to show the fishing-grounds of the Gulf coast of the United States.]

No. 1. **CAPTIVA FISHERY.**—Situated upon the north end of Captiva Island, mouth of Charlotte Harbor. Consists of temporary palmetto shanties, occupied only through the fall for the purpose of salting mullet for the Cuban markets.

No. 2. **SPANISH FISHERY.**—Situated at Lacosta Island, near the main entrance to Charlotte Harbor. Includes several buildings, mostly permanent, occupied in the fall for the mullet fishery. Spaniards from Key West carry on this fishery.

No. 3. **SPANISH FISHERY.**—Situated near No. 2 and similar to it.

No. 4. **GASPARILLA FISHERY.**—Situated upon Gasparilla Island, mouth of Charlotte Harbor. Several permanent shanties, owned by the Messrs. Peacons, of Key West, who salt mullet for the Cuban trade in the fall.

No. 5. **SARASOTA FISHERY.**—At the north end of Little Sarasota Island and on the Big Sarasota Pass. Mullet are salted for Cuban markets at this station in the fall. Temporary shanties.

No. 6. **SARASOTA FISHERY.**—Near the last. Occupied in 1879 for salting mullet for the Florida trade. Temporary shanties.

No. 7. **HUNTER'S POINT FISHERY.**—Situated upon Hunter's Point, the dividing line between Sarasota and Palmasola Bays. Mullet salted for Cuban markets. Buildings permanent and the best arranged on the coast. Owned by Sweetzer & Thomson.

No. 8. **PALMASOLA SMALL FISHERY.**—Situated on the back side of Palmasola Bay. Small permanent shanty, occupied each fall by gill-net and cast-net fishermen, who salt mullet for home trade.

No. 9. **PALMASOLA FISHERY.**—Near the last. Occupied by seining-crews every year for the purpose of salting mullet for home trade. A permanent palmetto shanty.

No. 10. **PALM KEY FISHERY.**—On the north end of Palm Key. Occupied sometimes by Key West fishermen and in 1879 by Appalachicola fishermen. This is a good station for mullet in the fall. Contains temporary shanties.

No. 11. **PASS A GRILLE FISHERY.**—On Long Key, in Boca Ceiga Bay. A station for catching and salting mullet during the fall months. Not occupied every year. The catch is usually sent to Cuba. The shanties are temporary ones.

No. 12. **TURTLE-CRAWL POINT FISHERY.**—At Turtle-Crawl Point, Boca Ceiga Bay. A mullet fishery, where fish are salted for the Florida trade. Small temporary shanties, not regularly occupied.

No. 13. **KILGORE'S FISHERY.**—On the passage from Boca Ceiga Bay to Clear Water Harbor. Mr. Kilgore salts fish during the fall for the country trade, and has permanent buildings near his house for the work.

No. 14. **ANCLOTE RIVER FISHERY.**—Situated at the mouth of the Anclote River. Parties are stationed here in the fall to catch mullet, which are sold in Florida. Appalachicola crews occupied it in 1879. Permanent shanty.

No. 15. **CRYSTAL RIVER FISHERY.**—At the mouth of Crystal River. A station occupied each fall by parties from the neighboring country or from Cedar Keys, engaged in the mullet fishery. Temporary shanties.

No. 16. **CHAMBERS MILL FISHERY.**—On the coast, a few miles north of the mouth of the

Crystal River. Mullet are caught here in the fall for Cedar Keys and the country trade. The buildings used are those of an abandoned saw-mill.

No. 17. SUWANNEE RIVER FISHERY.—At the mouth of the Suwannee River. Seining crews fish here for mullet in the fall to supply the country trade and sometimes for that of Cedar Keys. Temporary shanties.

No. 17a. PINEY POINT FISHERY.—On Piney Point, between Suwannee and Steinhatchee Rivers. Similar to the last. One permanent building.

No. 18. STEINHATCHEE RIVER FISHERY.—At the mouth of the Steinhatchee River. A mullet fishery for country trade. No buildings.

No. 19. FENHOLLOWAY RIVER FISHERY.—At the mouth of the Fenholloway River. Mullet fishing for country trade. Temporary shanties.

No. 20. OCILLA RIVER FISHERY.—At the mouth of the Ocilla River. Carried on for mullet in the fall. Catch sold in the country. Temporary shanties.

No. 21. SHELL POINT FISHERY.—A few miles west of the Saint Mark's River. Occupied in the fall by crews who salt mullet for country trade. Permanent shanties.

No. 22. OYSTER BAY FISHERY.—Carried on for mullet, which are sold to country customers. Seines and gill-nets are used. Buildings permanent.

No. 23. DICKERSON BAY FISHERY.—Same as the last. Buildings permanent.

No. 24. OCKLOKONY BAY FISHERY.—At the mouth of Ocklokony Bay. Same as Nos. 22 and 23. Permanent buildings.

No. 25. CROOKED RIVER or PICKETT'S FISHERY.—Occupied in the fall for mullet fishing. Catch sold, salted, at Appalachicola. Permanent shanties.

No. 26. CAT POINT FISHERY.—A station sometimes occupied by Appalachicola parties. Temporary shanties.

No. 27. INDIAN PASS FISHERY.—A gill-net station, occupied in the fall by Appalachicola crews. Permanent palmetto shanties.

No. 28. SAINT JOSEPH'S POINT FISHERY.—Occupied in the fall by Saint Andrew's Bay and Appalachicola crews, while salting mullet and other fishes, and in the spring to catch pompano, which are salted or sent to Pensacola fresh. They have several permanent palmetto shanties.

No. 29. CROOKED ISLAND FISHERY.—A station on the north end of Crooked Island, where Saint Andrew's Bay crews fish in the fall and spring, to catch pompano, mullet, sheep's-head, redfish, etc. Temporary shanties or tents.

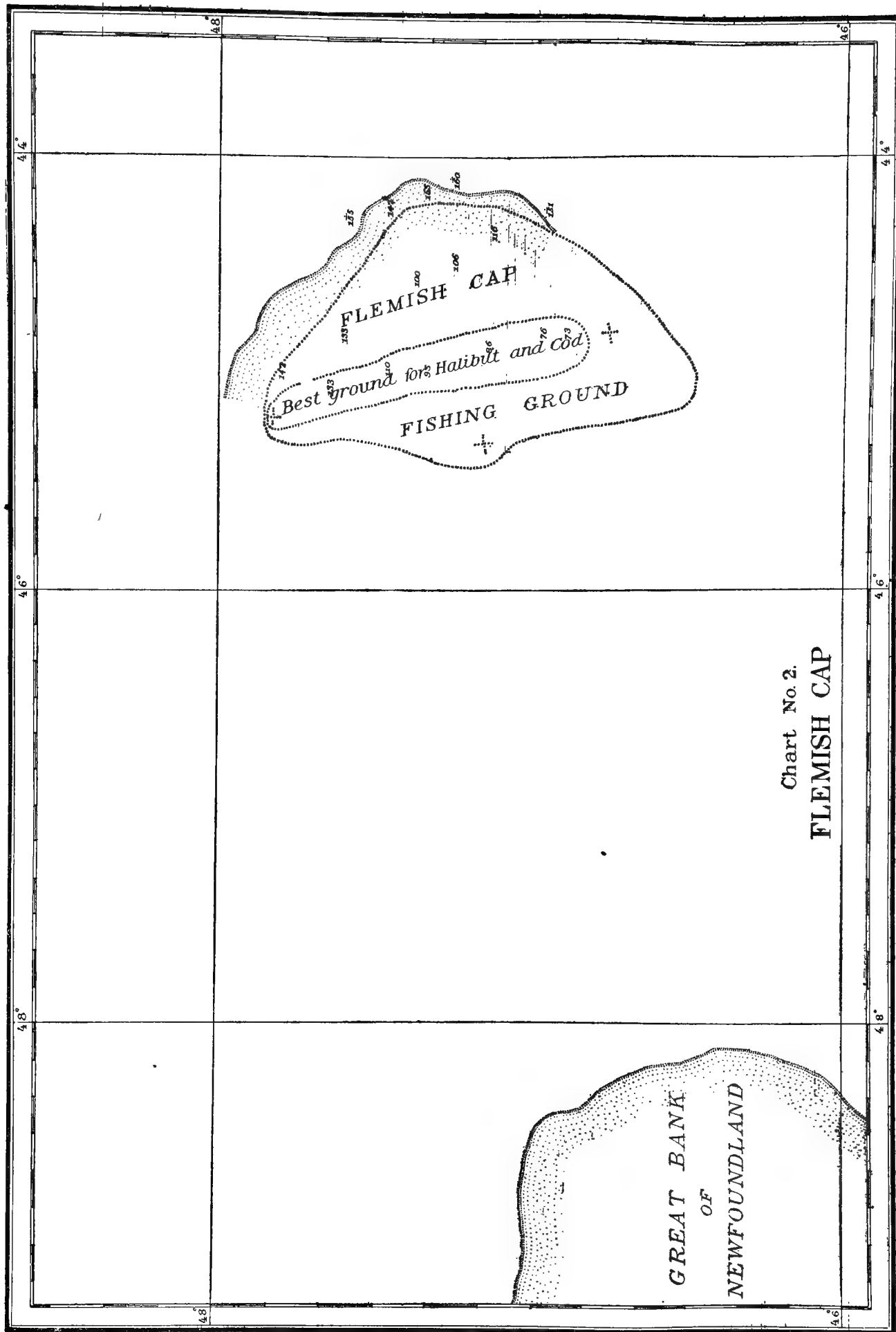
No. 30. SAINT ANDREW'S POINT FISHERY.—On the west point at the entrance to the bay, a station used by people of Saint Andrew's Bay for the same purpose as the last. Temporary shanties, and one permanent one.

No. 31. CAPT. LEN. DESTIN'S FISHERY.—At the Choctawhatchee or Santa Rosa Bay Inlet, Captain Destin has fish-house, ice-house, and very complete arrangements. He fishes nearly all the year, chiefly for pompano, and sends the catch to Pensacola in ice, also salts a few barrels annually for country trade. This is the most important pompano fishery in the Gulf.

No. 32. PETIT BOIS FISHERY.—On the island of that name, outside of Mississippi Sound, a station occupied nearly all the year by Mobile and New Orleans seine and gill-net fishermen. Fish sold fresh.

No. 33. HORN ISLAND FISHERY.—On Horn Island, outside of Mississippi Sound. A station similar to No. 32. Fish sold fresh. Permanent buildings for habitation.

No. 34. CHANDELEUR ISLANDS, No. 35. GRAND GOSIER ISLAND, and No. 36. ISLE BRETON, are all prominent stations for seine and gill-net crews from New Orleans, who resort to them at intervals through the year. No fish are salted at these places.



12. THE OFF-SHORE BANKS, INCLUDING THE GRAND BANKS.

THE FLEMISH CAP.

The Flemish Cap is the outermost of the Great Newfoundland Fishing Banks, as it is also the least perfectly known. The Admiralty chart locates its eastern end by three lines of soundings extending about northeast and southwest, but of its western limit absolutely nothing is known. The center of the series of soundings given on the chart lies about one hundred and fifty miles east-northeast of the northeastern part of the Grand Bank. Less than one-half of the intervening area between these two banks has yet been sounded, so far as indicated on the published charts, and the soundings off the northeastern end of the Grand Bank show depths of sixty to one hundred and forty-five fathoms only. There is, therefore, a possibility that the Flemish Cap extends much nearer to the Grand Bank, and has a much greater area than is indicated on the charts of the region, and it is even probable that this outlying shoal is a direct continuation northeastward of this same large bank. Combining the soundings of the Admiralty chart with information gathered from the Gloucester fishermen, who have visited this region, it would appear that the known area of the Flemish Cap was irregularly elongate in outline, the longer axis extending about north and south.

This area lies between the parallels of $46^{\circ} 50'$ and 48° north latitude, and the meridians of $44^{\circ} 06'$ and $45^{\circ} 25'$ west longitude, the greatest length being, therefore, seventy geographical miles, and the greatest width fifty-six miles. Its extent is about two thousand seven hundred and fifty square geographical miles. The soundings range from seventy-three to one hundred and fifty-five fathoms, the least depth being located near the center and the southern parts of the bank, and the deepest water occurring on the eastern edge. Beyond this, to the eastward, no depths were reached by the vessels making the survey of this region, but the sounding line they used appears to have had a total length of only about one hundred and sixty fathoms.

The bottom is composed of mud, sand, gravel, pebbles, and rocks, distributed in patches of variable extent and character. In the localities resorted to by vessels from the United States the prevailing bottom is often a slaty rock, apparently *in situ*, and forming a smooth surface, on which the anchor often fails to take a firm hold.

Cod and halibut are the only fish that have been sought for on the Flemish Cap. Nothing is known about their abundance in the winter, as the bank can only be visited in the spring and summer (April to August at the most). But often during the spring the weather is so rough that fishing can be carried on only a small part of the time, and after June the region is so much infested with ground-sharks that the trawls are rapidly destroyed. Another danger frequently arises from the presence of icebergs, which are often abundant. All of these causes combined have deterred fishermen from frequenting this bank, which, so far as known, has only been visited for cod and halibut by a few vessels from Gloucester during the past few years.

The region thus far resorted to for cod lies mainly within a distance of ten to fifteen miles of 47° north latitude and 45° west longitude. In one or two instances, however, large catches of cod as well as halibut have been obtained from eighteen to twenty miles west of the forty-fifth meridian in 47° north latitude. According to the statements of the fishermen most familiar with these grounds, no trouble is ever experienced in obtaining large quantities of medium-sized cod, which are, however, below the standard recognized in the United States markets. Larger fish are less common, although taken in considerable numbers, and very successful fares have occasionally been made. The general opinion is that while fish are sufficiently abundant, no

great dependence can be placed on securing a profitable trip, on account of the several hindrances alluded to.

The best known halibut grounds of the Flemish Cap are said to be located near the meridian of 45° west longitude, between the parallels of $47^{\circ} 30'$ and $47^{\circ} 50'$ north, where the bottom consists of rocks, pebbles, and coarse gravel. The only vessels that have visited the Flemish Cap have been those engaged in the salt halibut and cod fishery.

THE GRAND BANK.

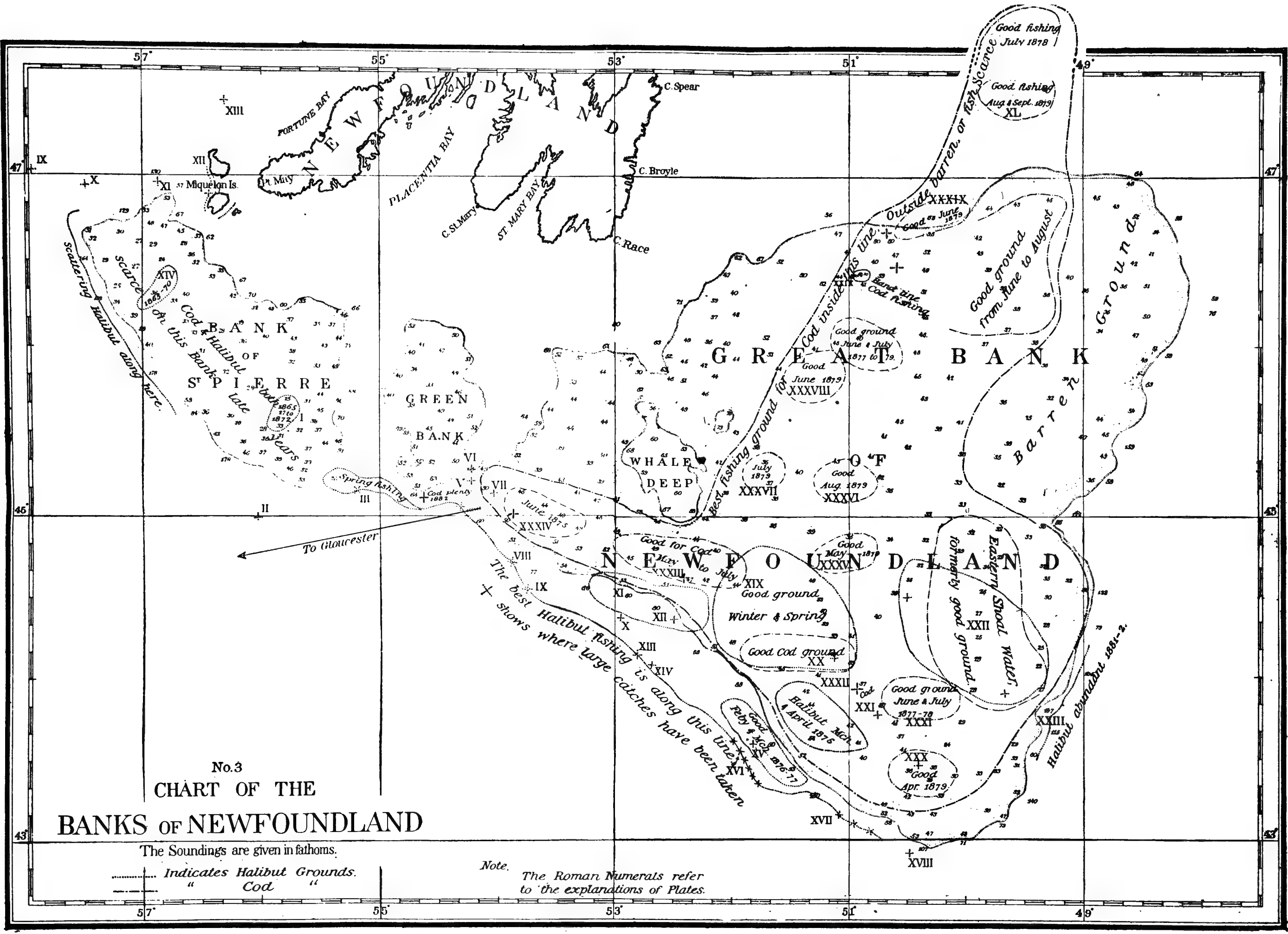
This immense fishing-ground, which lies southeasterly from Newfoundland, is of about the same size as that British province, and equals in extent all of the other off-shore fishing-banks of the eastern coast combined. Its area, within the sixty-fathom limit, is about thirty-seven thousand square geographical miles. It extends over more than four degrees of latitude from $42^{\circ} 57'$ to $47^{\circ} 04'$ north, and over nearly six degrees of longitude, from $48^{\circ} 06'$ to $54^{\circ} 11'$ west, and has an irregularly triangular outline, one side facing north-northwest, another southwest, and the third about east by south. The northwestern and eastern sides are each about two hundred and sixty-four miles long in a straight line, and the southern side about two hundred and twenty-five miles long.

The most remarkable shoals are the Virgin Rocks and Eastern Shoal Water, located near the center of the northern part of the banks. The channel separating the bank from Cape Race has a width of about thirty-six miles. Considered both as to its area and the extent of its fisheries, the Grand Bank is undoubtedly the most important fishing-ground of the world.

In order to describe its somewhat varied characteristics in sufficient detail, we have, for the sake of convenience, divided the area of the bank into several arbitrary sections suggested by their importance as fishing grounds.

South of 44° north latitude the depths range from twenty-five to fifty-three fathoms, and the bottom consists almost entirely of fine sand, varying somewhat in color. Over the east and west portions of this section there are, however, a few scattered patches of coarse sand and gravel with an admixture of small pebbles, and occasionally of rocks of larger size. The eastern edge drops off rapidly at a distance of a mile or more from the sixty-fathom limit, but halibut have been found there abundantly in depths of one to three hundred fathoms. On the western side of the slope the descent is apparently more gradual, especially north of the parallel of 44° north latitude, where a depth of one hundred and fifty fathoms is found at a distance of twenty-five miles or more from the edge of the bank. Over the greater part of this area there occur large numbers of bank quahogs (*Cyprina islandica*), bank clams (*Siliqua costata*), periwinkles (*Buccinum*), and small crustacea, and wherever the bottom is pebbly, sea anemones, sea pumpkins or holothurians, and sea lemons (*Boltenia*) abound, and crabs are generally plentiful. Owing to the strong currents that sweep by the eastern edge, and the frequent occurrence there of large icebergs, fishing in that locality is attended with many difficulties and some danger.

Another section may be laid out between the parallels of 44° and $45^{\circ} 20'$ north latitude, and extending the entire width of the bank. The eastern part of this section, in the vicinity of and to the eastward of the meridian of 50° west, is generally known as the "Eastern Shoal Water." It has depths of twenty-two to thirty-five fathoms, and the bottom is mainly composed of fine sand, with an admixture of gravel, pebbles and large stones over certain areas. The eastern edge descends rapidly into comparatively deep water. The fauna of this section resembles that of the southern section already described. Between 50° and 51° west longitude lies what is known among fishermen as the "pumpkin bottom," from the immense quantities of a large



No.3
CHART OF THE
BANKS OF NEWFOUNDLAND

The Soundings are given in fathoms.

..... Indicates Halibut Grounds.
- - - - - " " Cod " "

Note.
The Roman Numerals refer
to the explanations of Plates.

holothurian found there. The depths vary from thirty to thirty-eight fathoms, with a bottom of sand, gravel, pebbles, and smooth, round rocks. In addition to the holothurians, large numbers of star-fishes, periwinkles, crustaceans, bank quahogs, and bank clams also occur. West of 51° west longitude and north of $44^{\circ} 20'$ north latitude, in this section, the depths range from thirty-six to fifty-five fathoms, the latter soundings occurring only along the edge of the bank. The bottom is mostly rocky, the rocks being much perforated with a species of boring mollusk. The fishermen's hooks frequently catch in these holes and large fragments of the rock are in this manner often brought to the surface.

Besides many of the lower forms of animal life common to other sections of the Grand Bank, this area especially abounds in crabs and shrimps, and many specimens of octopus have been taken from the stomachs of fish captured here. To the westward of the sixty-fathom line, the bottom slopes more or less gradually to a depth of two hundred fathoms, which it reaches at a distance of ten to fifteen miles from that line. Within the area of this slope the bottom is generally composed of sand or mud; but along the edge outside of one hundred and fifty fathoms, there occur numerous rocky patches of considerable size. This section, between 44° and $45^{\circ} 20'$ north latitude, in depths generally less than 55 fathoms, is more commonly resorted to by the cod fishermen than any other part of the Grand Bank.

That portion of the bank lying between $45^{\circ} 20'$ and 46° north latitude can be considered as a third section, concerning which but very little is yet known. In consequence, the greater part of this region is generally regarded as barren by the fishermen, although, by trial, it is possible that portions of it might furnish good fishing. It has so far been but very little resorted to. This section has depths of thirty-two to fifty-seven fathoms, and embraces a great variety of bottom in its different parts—fine and coarse sand, pebbles, rocks, and broken shells, variously combined. Good catches of cod have been obtained between 50° and 51° west longitude. The "whale deep" occurs on the western part of the section. It is an irregular, shallow depression in the bank, extending nearly north and south, with a length of about forty-five miles and a width of about twenty-three miles. Its southern end lies in about $44^{\circ} 58'$, and its northern in $45^{\circ} 41'$ north latitude. The extreme eastern part is in about $52^{\circ} 14'$ west longitude. It has depths of fifty-seven to sixty-seven fathoms, the bottom consisting of mud. We are not informed as to the origin of the name by which this area is known, but it does not seem very appropriate, for one of its chief characteristics appears to be the absence of whales as well as of fish; while its shallowness, as compared with the depths at a short distance off the western edge of the bank, is quite marked.

The fourth or northern section of the Grand Bank comprises all that portion lying north of the parallel of 46° north latitude. It has an elongate triangular shape, being one hundred and eighty miles long on the parallel of 46° , and is about sixty-four miles wide on the eastern part, where it extends to $47^{\circ} 04'$ north latitude. Its width near the middle is about forty-five miles. This section includes the Virgin Rocks, which lie in $46^{\circ} 27'$ north latitude and $50^{\circ} 54'$ west longitude. The area westward of the Virgin Rocks has depths of thirty-seven to fifty-three fathoms, and a diversified bottom of sand, gravel, pebbles, broken shells, and large rocks. It is comparatively little resorted to by the fishing-fleet, and for this reason is less known than most of the other parts of the bank.

The group of small, rocky shoals, known as the Virgin Rocks, lies between $46^{\circ} 23'$ and $46^{\circ} 28'$ north latitude, and $50^{\circ} 50'$ and $50^{\circ} 58'$ west longitude. It consists of a large number of submerged elevations, the principal ones being named and characterized as follows: Main Ledge, lying in $46^{\circ} 27'$ north and $50^{\circ} 47'$ west, depths, three to nineteen fathoms; Brier Shoal, just

east of Main Ledge, thirteen to twenty fathoms; Southwest Rock, southwest of Main Ledge, fourteen fathoms; part of Main Ledge, twenty-nine fathoms; Bucksport Shoal, one and one-fourth miles nearly south of Main Ledge, four and three-fourths to eleven fathoms. A short distance from the latter shoal, on the south and east sides, are three other smaller shoals, called Sea Patch, Lone Star or Harper Shoal, and Bryant Shoal, with depths varying, from eleven to nineteen fathoms. South of these again, within a distance of one and three-fourths miles, are three more shoals, known as the Bull Dog, Old South Shoal, and Cabinet Shoal, with depths of seventeen to twenty fathoms. About one mile due north from Main Ledge begins a line of eight small shoals, which extends a distance of about three miles, with depths of nine to twenty-three fathoms. The nearest ones are called Northwest Shoals, and the remainder, in the order of their position, are Maloney Ledge, Prairie Shoal, The Hummocks, and Deep-Water Bank.

Fifteen miles eastward of the Virgin Rocks, between $46^{\circ} 27'$ and $46^{\circ} 29'$ north latitude, there is a group of similar shoals, known collectively as the Eastern Shoals. They extend about four miles north and south, and have an average width of a little more than two miles. Each shoal is of slight extent, but few of them exceeding one-fourth of a mile in diameter. There are twenty-five of these shoals in all, on which the depths of water range from seven to twenty-seven fathoms; between the shoals the depths vary from twenty-eight to thirty-nine fathoms, and the bottom is broken and rocky.

Between the Virgin Rocks and Eastern Shoal and about them the depths range from thirty-three to forty-eight fathoms, and the bottom consists of sand, coarse gravel, rocks, and broken shells. Bank clams (*Siliqua costata*), abound here, and squid and capelin are plentiful in their season, attracting large numbers of cod and making this region a very profitable one for the fishermen. Halibut also formerly occurred here in large numbers. The cod which frequent these shoals are generally of somewhat smaller size than those taken on other parts of the Grand Banks; they are caught with hand-lines on the shoaler areas, where the fishermen go in dories, one man to each boat, while the vessels lie at anchor near by.

The eastern part of the northern section of the Grand Bank, lying eastward of the Eastern Shoal and westward of 49° west longitude, has depths of thirty-seven to forty-five fathoms. The bottom consists of sand, coarse gravel, pebbles, rocks, and broken shells, much of this area being covered with rocks and supporting a rich assemblage of animal life. This rocky bottom is composed essentially of smooth round bowlders, distributed over sand, many of them being perforated by boring mollusks. Immense numbers of crustaceans, especially crabs, abound here, together with bank clams and other shell-fish, small star-fish, Holothurians, Ascidians, etc. This is one of the most favorable grounds for cod, principally from July to September.

That portion of the northern section lying east of the forty-ninth meridian is much less resorted to than the last above described, and is, therefore, less known. The depths of water range from thirty-four to fifty-four fathoms, and the bottom consists of sand, pebbles, and rocks.

North of the northeastern portion of the Grand Bank, the bottom slopes off gradually a distance of forty to forty-five miles from the edge of the bank, the depths nowhere exceeding seventy-five fathoms, excepting in a few small areas. The bottom is composed of sand, mud, and pebbles, the shoaler portions, with depths of fifty-five to sixty-five fathoms, being generally composed of coarse sand and rocks. Within the past five years good catches of cod have been made in this region by Gloucester fishing-vessels.

THE FISHERIES OF THE GRAND BANK.—The most important fishery of the Grand Bank is that for cod, which is engaged in by vessels from France, the United States, and the British

provinces. During the fishing season, which lasts from April first to October, large fleets of vessels from these three countries visit the different parts of this bank. In the early part of the season, April and May, the southern portion of the bank is principally resorted to, and good catches are frequently made south of 44° north latitude. As a rule, however, the larger part of the fleet remain between 44° and 45° north latitude. At this season, sand lant are especially abundant on this part of the bank, and large numbers are often found in the stomachs of the cod. In June, capelin make their appearance on the bank, at which time the cod seem to greatly increase in numbers. This body of cod, found in connection with the capelin, or in the capelin season, has received from the fishermen the name of "capelin school." It is distributed over all parts of the bank visited by the fishing-fleet. After the beginning of June, many of the vessels move to the northern part of the bank, fishing in the vicinity of, and to the eastward of, the Virgin Rocks. Very few vessels now remain south of 44° north latitude, for the best fishing is found between 44° and $45^{\circ} 20'$ north latitude, and to the northward of 46° north latitude.

As a rule, squid make their appearance on the Grand Bank in July, after which time but few fish can be caught with capelin or herring bait. The body of cod now occurring on the bank is termed the "squid school" by the fishermen. It is probable that these schools of cod, though known by different names, are composed mainly of the same fish that come on the bank in the spring, though with the addition of many others, which appear to be attracted to the region during the summer by the schools of capelin and squid. They occupy the same ground, and the fishing continues through September. Formerly, cod were abundant till December, but, at present, these fish leave the bank at a comparatively early period in the fall.

The cod fishery of the Grand Bank dates from the earliest settlement of North America and it probably had much to do with the opening up of our country in those early times.

The halibut fishery began on the Grand Bank about 1865, and has been vigorously prosecuted there ever since. At first the vessels resorted to Eastern Shoal-water, between $43^{\circ} 45'$ and 45° north latitude, where halibut were then found in immense numbers. Though so abundant at first their numbers soon became greatly reduced, and consequently other grounds were sought for. For a series of years that section of the bank lying west of 51° west longitude, and between $43^{\circ} 40'$ and 45° north latitude, was the favorite halibut ground, and several large fares of halibut were also taken in the immediate vicinity of the Virgin Rocks for two successive years (1869 and 1870), during the months of July and August. Notwithstanding the great abundance of halibut on the shoaler parts of the bank (from twenty-two to fifty fathoms), during the earlier years of the fishery, their capture was followed up so closely that they rapidly became much less numerous, and the fishermen were forced to seek new fields in the deeper waters (one to three hundred fathoms) along the southern and western edges of the bank. When first discovered in these deeper places, they were found in incredible numbers all along the western part of the bank in the winter and spring, and during the entire summer in other localities off the Northwest Prong. Although even in these places halibut are much less abundant now than formerly, the Grand Bank is still the great resort for vessels engaged in this fishery, and this region yet remains the most important halibut fishing-ground of the Western Atlantic.

When the halibut fishery first began on the Grand Bank, large catches could be made in the shoal waters during the entire year. After two or three years' continuous fishing, however, they could be found abundantly on the shoal grounds only in the winter and spring. While they were crossing the bank on their way to more northern localities or to deeper water, to which they were not known at that time to resort by the fishermen, it was supposed that they came on the bank from the eastern and southern edges, as they were distinctly seen to move towards the northwest.

More recently, since the beginning of the deeper-water fishing, it has been discovered that they more commonly migrate toward the northwest, along the edge of the bank on the west side, and in some cases their course has been traced even beyond the limits of the Grand Bank.

Since the foregoing was written (1880), halibut have been found in abundance in the deep water off the eastern side of the bank, but owing to the presence of icebergs during the greater part of the year, and the strength of the polar current in that region, but few vessels have ventured there.

GREEN BANK.

Green Bank is for its size one of the least important of the fishing-banks of the Western Atlantic, but one of the best halibut grounds lies in the deep water near its southern part, and as this is also called Green Bank by the fishermen, it may not be out of place to consider it in this connection. This bank has an irregular, elongate pear-shaped outline, the longer axis extending due north and south. It is situated between Grand and Saint Pierre Banks, being seven miles distant from the former and fifteen miles from the latter. Its extreme length within the sixty-fathom line, is sixty-two miles, north and south, from $45^{\circ} 09'$ to $46^{\circ} 11'$ north latitude, and its width is thirty-six miles, between the meridians of $54^{\circ} 08'$ and $54^{\circ} 58'$ west longitude. The area of the bank is about fourteen hundred and fifty square geographical miles. The depths range from forty to sixty fathoms, and the bottom is composed of sand, shells, pebbles, and rocks. The general direction of the polar current, which sets over this bank, is usually from the north to the southwest, its course, as well as its force, being more or less influenced by the wind. But little is known of the abundance of cod here, as the fishermen prefer to resort to grounds with which they are better acquainted and have seldom fished on this one. Within the past two or three years, however, some good fares of cod have been taken on Green Bank, in the late summer and the fall, by New England vessels.

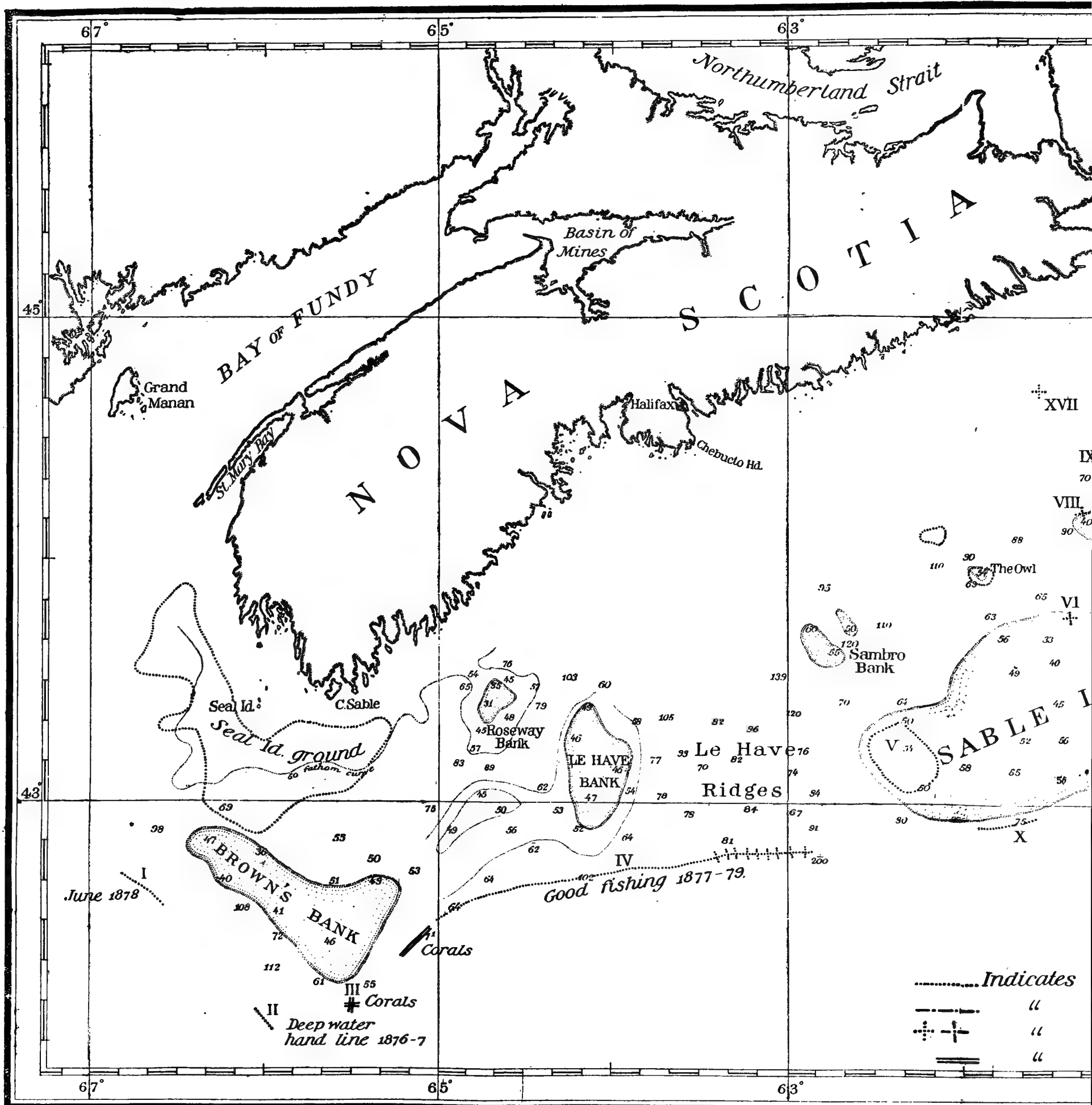
Since 1875, halibut have generally been found very abundantly in the winter and spring, and sometimes even during the summer, in from seventy-five to three hundred fathoms, off the southern edge of the bank, between the Grand Bank and Saint Pierre Bank.

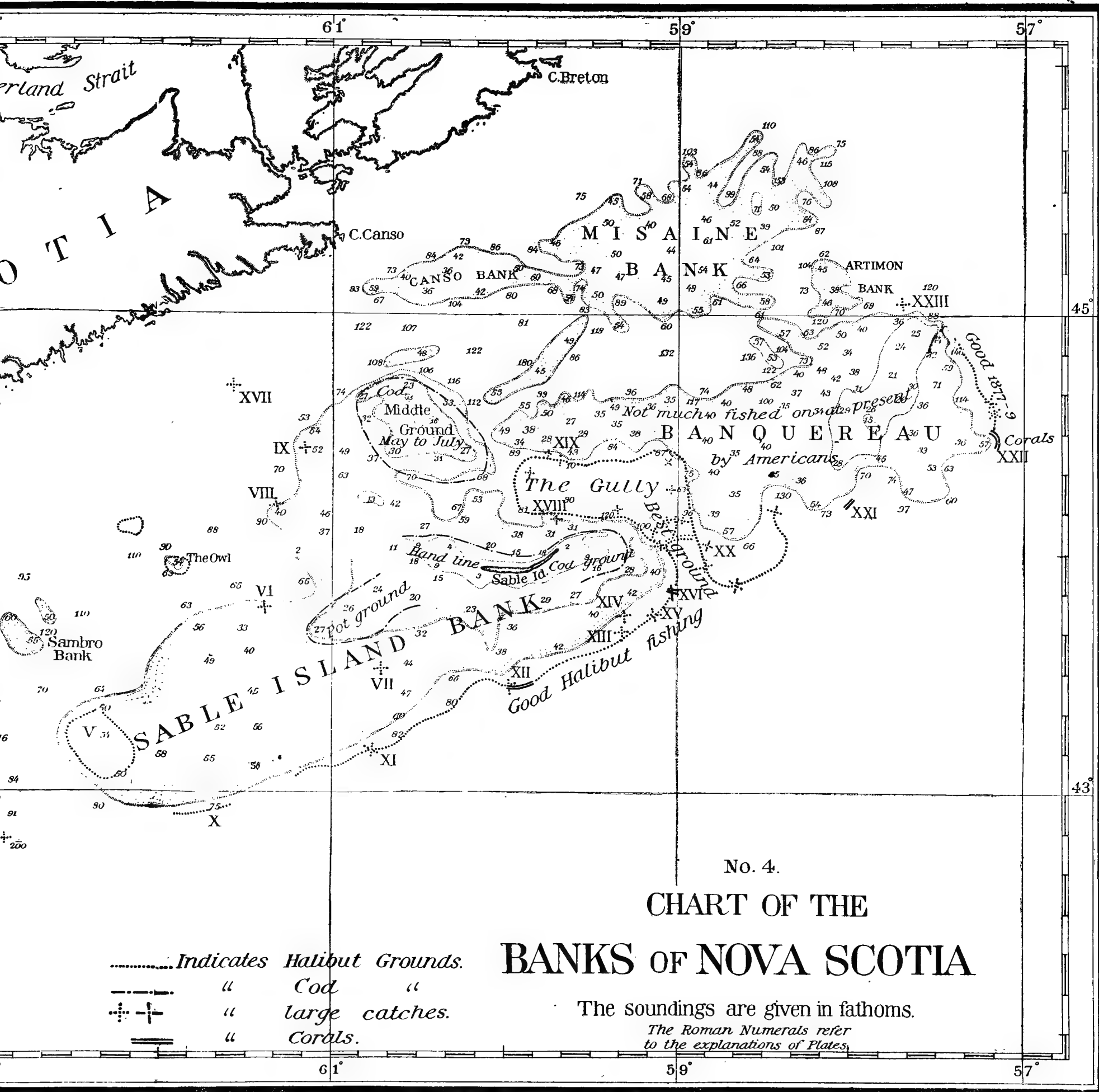
This locality appears to be a feeding-ground in the winter, and during the spring lies in the direct course taken by the halibut in their migrations from the Grand Bank to other places farther north. At this season it is not uncommon for immense schools to make their appearance in this region and move leisurely along the edge of the bank. The only vessels fishing for halibut at this place are from Gloucester, Massachusetts.

BANK OF SAINT PIERRE.

The Bank of Saint Pierre is situated off the center of the southern coast of Newfoundland, between the parallels of $45^{\circ} 10'$ and $46^{\circ} 54'$ north latitude, and the meridians $55^{\circ} 16'$ and $57^{\circ} 30'$ west longitude. It is irregularly oblong in shape, about twice as long as broad, and extends in a northwest and southeast direction. At the northwestern extremity it is about half as wide as at the southeastern, where it rapidly broadens out, and ends abruptly along a nearly straight line bearing north and south. The longest side of the bank, which measures about one hundred and twenty-five miles, presents a slight outward curve and faces the southwest. The width of the northwestern end is about thirty-five miles, and that of the southern end sixty-five miles.

The northeastern edge of the bank is distant about twenty-seven miles from the nearest point on the Newfoundland coast, and from nine to ten miles from the islands of Saint Pierre and Miquelon. The gully separating Saint Pierre Bank from Green Bank runs directly





north and south, has a minimum width of fifteen miles, and depths ranging from sixty-five to one hundred fathoms. The total area of Saint Pierre Bank is about forty-six hundred square geographical miles. The depths range from twenty-two to fifty fathoms, the bottom being mostly composed of rocks and pebbles, although in some parts there are considerable areas of sand and gravel. Ordinarily, there is not much current over this bank, although at times, when driven by strong winds, the polar current, which sweeps around the south coast of Newfoundland, becomes quite strong.

Cod and halibut are the only food-fishes found in any considerable numbers on the bank of Saint Pierre, though a few cusk and haddock are sometimes taken. The general season for both cod and halibut begins usually about the first of April and continues until November. Cod are most abundant from the first of June to October, during which period they come in pursuit of capelin and squid. Halibut were formerly abundant on various parts of this ground during the spring and summer, but now they are rarely numerous except in the deeper water along the edges, or on rocky spots fifteen to twenty miles distant from the bank, in localities where no soundings are indicated on the published charts. Some of the schools of halibut breed on these rocky patches, but the greater number merely pass along the edge during their migrations toward the north. But few fishing-vessels, beyond the fresh halibut catchers and those owned by the French, resort at present to the bank of Saint Pierre, as some of the other neighboring banks offer much greater inducements. Saint Pierre has, therefore, lost a great deal of its former prestige as a fishing-ground, and assumes but a second rank among our great ocean banks.

The invertebrate fauna of this bank is moderately rich, but much less so than that of many parts of the Grand Bank, the fauna of the two regions including, however, about the same variety of forms.

BANQUEREAU.

Banquereau may be regarded as one of the most important fishing-banks lying between the fortieth and forty-eighth parallels of north latitude. Its entire outline is very irregular, but the main portion of the bank has a somewhat rectangular shape, with an elongate and nearly regular prolongation extending to the west. The length of the bank in an east and west direction is a little more than one hundred and twenty miles, and its greatest width about forty-seven miles; its total area is about two thousand eight hundred square miles. The main portion of the bank lies between $44^{\circ} 04'$ and $45^{\circ} 01'$ north latitude, and $57^{\circ} 10'$ and 59° west longitude, and the western prolongation between $44^{\circ} 24'$ and $44^{\circ} 42'$ north latitude, and 59° and $60^{\circ} 05'$ west longitude. North of Banquereau lie Artimon and Misaine Banks, the former being distant only about three miles and the latter from two to fifteen miles, the intervening depths ranging from sixty-one to one hundred and fifty-five fathoms. South of the western part of the bank is the eastern part of Sable Island Bank, from which it is separated by the "Gully" to be described further on.

On the eastern part of Banquereau there is an area of shoal ground, called the "Rocky Bottom," having a depth of about sixteen fathoms; elsewhere the depths range from eighteen to fifty fathoms, and the bottom is rocky as a rule, but on some parts of the bank there are patches of sand and gravel.

A current issuing from the Gulf of Saint Lawrence here meets the polar current, but although this produces some disturbance of the surface waters, the latter current is usually the stronger, and the tendency of the flow is, therefore, chiefly towards the west. The force as well as the direction of the current is much influenced by the wind, so that while quite strong tides may prevail for several days at a time, intervals may follow when there is but little if any current.

Cod and halibut are about the only fish taken in abundance on Banquereau, but hake, haddock, and cusk are sometimes found in small numbers. The Rocky Bottom is principally resorted to for cod, by the hand-line dory fishermen during the summer, and at times several hundred dories can be seen fishing there close together. As a rule, cod are most plentiful on the eastern part of the bank, although good catches are sometimes made toward the west. The best season for them is from May to November, when the schools gather upon the bank to feed on the lant, squid, crustaceans, and shell-fish, which are then very abundant.

Halibut are found throughout the entire year off the edges of the bank, where, at depths of one hundred to four hundred fathoms, large numbers are often taken. These localities are apparently both feeding and breeding grounds for halibut, and it is not unusual for a school of these fish to remain several weeks or even months in one locality, although it is very probable that some of the schools observed on the eastern side of the bank in the spring are migrating toward the north.

The principal places for halibut are along the southern and eastern borders of the bank; the Southwest Prong (in about 44° north latitude, and between $58^{\circ} 30'$ and $58^{\circ} 55'$ west longitude); the Middle Prong ($44^{\circ} 14'$ north latitude and 58° west longitude); and the Eastern Slope (from $44^{\circ} 28'$ to 45° north latitude), in depths of one hundred and fifty to four hundred fathoms. These deep-water areas are rocky, and support a very rich growth of Gorgonian corals, sea anemones, etc.

ARTIMON BANK.

Artimon Bank lies north of the eastern part of Banquereau, from which it is separated by a narrow gully. It is of such limited extent (about one hundred and twenty square miles) that, compared with the latter, it is of but slight importance as a fishing-ground. The fishermen generally prefer to fish on the larger bank, and therefore know but little concerning the abundance of fish here, although it is certain that cod occur in greater or less numbers. This bank is fourteen miles long and ten miles wide, with depths of thirty-eight to fifty fathoms, and a bottom of coarse gravel and rocks.

MISAINÉ BANK.

This bank lies north of the western two-thirds of Banquereau, from which it is mainly separated by a channel about twenty miles wide. The eastern prolongations of these banks, however, approach one another quite closely. Misaine Bank has a very irregular outline, its general trend being about northeast by east and southwest by west. It lies between the parallels of $44^{\circ} 55'$ and $45^{\circ} 45'$ north, and the meridians of $58^{\circ} 06'$ and $59^{\circ} 50'$ west. Its greatest length is, therefore, about eighty miles and its greatest width about forty miles, its superficial area amounting to about seventeen hundred square geographical miles. The depths of water range from forty to sixty fathoms, and the bottom is generally broken and rocky.

But little is known concerning the abundance of fish on this bank, as it has been very rarely visited by vessels. It is probable, however, that occasional visits have demonstrated that cod are less abundant here than elsewhere in this region, and that this bank does not afford as profitable fishing as some others not far distant from it. This seems remarkable when we consider its large size and close proximity to Banquereau, which is an exceedingly valuable ground for both cod and halibut.

CANSO BANK.

Canso Bank is situated to the southeast of Cape Canso, Nova Scotia, from which it derives its name. The distance of its western end from the cape is about twelve miles. It is really a

western extension of Misaine Bank, with which it is connected by a narrow neck. It is very elongate, extending in an east and west direction, and lies between about $59^{\circ} 50'$ and $60^{\circ} 50'$ west longitude and $45^{\circ} 01'$ and $45^{\circ} 16'$ north latitude. Its length is about forty-five miles, its greatest width about thirteen miles, and its area not far from four hundred and twenty-five miles. The depths of water on this bank range from thirty to fifty-six fathoms and the general character of the bottom is sandy, with spots of gravels and pebbles. It is unimportant as a vessel fishing-ground, and is too far distant from the land to be much resorted to by small boats.

THE GULLY.

The so-called Gully of the bank fishermen is the deep passage-way lying between Banquereau and Sable Island. It extends in a west-northwest and east-southeast direction north of Sable Island, but turns abruptly toward the south at its eastern end, and continues down between the eastern end of the Western Bank and the southwest prong of Banquereau. It constitutes an important halibut ground. Its entire length is about sixty miles, and its greatest width twenty miles. The depths range from sixty-six to one hundred and forty-five fathoms, and the bottom consists of rocks, gravel, sand, and mud. The rocky and gravelly portions form several ridges, separated generally by areas of the finer materials, excepting in the eastern section, where the intervening bottom is mostly composed of pebbles and sharp rocks. The ocean currents generally set over this area in a westerly direction, but vary much in strength, an easterly wind often increasing their force, while at other times there may be no perceptible current at all. Halibut have not been found, at least not in sufficient numbers to warrant fishing for them, over the entire extent of the Gully; but the halibut grounds proper are limited to the rocky and gravelly ridges and slopes of that portion of the Gully included between the meridians of 59° and 60° west longitude. When this fishery began it was carried on chiefly during the spring, in the northern and western part of the Gully; but in 1877 the fishermen made successful trials farther out, taking good fares even as late as June and July; since then good catches have been obtained in the winter, and it would appear that the halibut come here merely to feed, as they generally move to other localities just previous to the spawning season. With a few exceptions, Gloucester halibut vessels are the only ones that have fished on this ground. Instances are on record of the appearance of cod in the Gully in sixty-five to ninety fathoms of water, but they are not found regularly in the same places each year. The rocky bottoms of the Gully are very rich in animal life, affording abundant food for the halibut, and lant and herring are also frequently plentiful in their season.

SABLE ISLAND BANK OR WESTERN BANK.

Western Bank is one of the most important fishing-grounds of the Western Atlantic, considered either as to size or the abundance of fish. It lies south of Cape Breton Island and the eastern part of Nova Scotia, between the parallels of $42^{\circ} 55'$ and $44^{\circ} 46'$ north latitude and the meridians of $59^{\circ} 04'$ and $62^{\circ} 35'$ west longitude, and has a length of one hundred and fifty-six miles and a width, including the Middle Ground, of seventy-six miles. The general contour of the bank within the sixty-five-fathom line, as laid down on the Admiralty chart, approaches somewhat a very elongated ellipse, with the longer axis running about northeast by east and southwest by west; but over a broad area to the eastward of the center of the bank soundings of less than sixty fathoms connect it directly with Middle Ground, which we have here included in the same bank. The total extent of the bank thus defined is about seven thousand square geographical miles. Off its eastern end lies Banquereau, with the Gully between, and a short distance off the western end are the Le Have Ridges.

The depths off the southern side of the bank rapidly increase from sixty to seven hundred, twelve hundred, and fourteen hundred fathoms.

At the eastern end of Western Bank is Sable Island, a long and narrow crescent-shaped elevation, entirely formed of sand, which has been blown into innumerable hummocks or dunes. Off both ends of the island are long and dangerous sand-bars. The length of the island is about twenty miles, and its greatest width one and one-half miles. It extends in a nearly east and west direction. The depth of water on the bars, for a distance of from seven to ten miles, does not exceed two fathoms, and even ten miles farther out, both to the east and west, the depths are not greater than ten or eleven fathoms.

As a general rule, the bank slopes gradually from the island toward the south and west, the depths ranging from eighteen to sixty fathoms. The bottom is mostly sandy, with patches of gravel and pebbles. On the Middle Ground there are several shoal spots, with depths of ten to nineteen fathoms. The currents are occasionally quite strong in the vicinity of Sable Island and generally very irregular, being much influenced by winds. On the remainder of the bank there is usually but little current, whatever there is usually tending in a westerly direction.

Cod and halibut are the principal food-fish taken, other species of bottom swimmers occurring in less numbers. Cod are generally most abundant in the spring, from the first of March to June, although good fares are obtained throughout almost the entire year. For more than twenty-five years the Western Bank has been a favorite resort of the halibut fishermen. At first, these fish were found very plentiful on different parts of the bank in from forty-five to sixty fathoms, and since 1876 have been caught in great numbers along the edges on the south and east sides, in one hundred to three hundred fathoms. Like the cod, they are found during the entire year, the period of greatest abundance, however, being from the first of January to the first of October. The Western Bank may be considered both as a feeding and spawning ground for the cod and halibut. It abounds in shell-fish (quahogs, mussels, clams, and periwinkles), and crustaceans (crabs, shrimps, etc.), as well as in several species of small fish (lant and herring), upon which the cod and halibut prey. Although the cod do not gather in such great schools in winter as they do on George's Bank, it is nevertheless quite evident that they assemble at that season for the purpose of reproduction. Usually they are found most abundant on the western part of the bank in winter, but as spring advances they move into shoaler water in the vicinity of Sable Island, the "bend" of the island and the region about the bars being favorite grounds during the late spring and early summer. The fish taken near the island are, as a rule, somewhat smaller than those caught farther west. Vessels from all along the New England coast and from the British provinces resort to this bank to pursue the cod fishery, but fishing for halibut is almost exclusively carried on by the Gloucester fleet. The two bars at the eastern and western ends of Sable Island, as well as the shoal water off the northern side of the island, are favorite localities for dory hand-line fishing for cod.

THE OWL AND DOUBTFUL BANKS.

The Owl is a very small bank, lying in 43° 57' north latitude, and 61° 55' west longitude. It is somewhat triangular in outline, being about five miles long by three miles wide at the broadest end, and having an area of about ten square miles, as laid down on the Admiralty chart. The only depth of water given is fifty-four fathoms, with sixty to ninety fathoms off the edge.

Doubtful Bank lies about fifteen miles northwest of the Owl, and is of less extent than the latter, having an area of about six or seven miles only. The depth of water is thirty-two fathoms, eighty-two fathoms occurring in the immediate vicinity. Both of these small grounds

have in times past furnished a few good trips of halibut, but they are not now considered of any importance to that fishery. They are, however, more or less resorted to for cod by American vessels.

SAMBRO BANK.

Sambro Bank lies between the parallels of $43^{\circ} 36'$ and $43^{\circ} 47'$ north, and the meridians of $62^{\circ} 40'$ and $62^{\circ} 55'$ west, the greatest length, northeast by north and southwest by south, being twelve miles and the greatest width seven miles. The area of the bank is about seventy square miles. It has a depth of fifty-four to sixty fathoms, with depths of one hundred and ten to one hundred and thirty-three fathoms a short distance off its northeastern edge. The bottom consists mostly of sand, gravel, and pebbles. Sambro Bank, from its small size, is seldom visited by fishing-vessels, and has, therefore, never attained any importance as a fishing-ground.

LE HAVE BANK.

Le Have Bank is situated to the eastward of Brown's Bank, and south and east of Roseway Bank. It extends from $42^{\circ} 34'$ to $43^{\circ} 26'$ north latitude, a distance of fifty-two miles, and from $63^{\circ} 50'$ to $65^{\circ} 07'$ west longitude, a distance of about fifty-four miles. The bank is nearly divided into two portions, of which the eastern portion (Le Have Bank proper) extends north and south thirty-nine miles, and the western portion nearly east and west about thirty-five miles. The total area of the bank is about twelve hundred and forty square miles. The bottom is largely composed of coarse gravel, pebbles, and rocks, with smaller areas of sand distributed here and there. The depths of water range from forty to fifty fathoms. The general set of the current is to the westward, but this, however, is influenced very much by the direction and force of the wind, generally running quite strong during easterly winds. The principal fish taken on this bank are cod and haddock, although other species of bottom feeders are more or less plentiful. Cod are found at all seasons of the year, but are, perhaps, more abundant during the early winter than at any other period, and good trips are frequently obtained by the Gloucester vessels, which are the only ones that go there at that season. The Gloucester winter haddock-catchers, which carry their catch fresh to the Boston market, have extended their trips from George's and Brown's Banks to Le Have, and during the present winter (1880-'81) have made some remarkably good fares, several of them being the largest on record. Most of the lower forms of animal life found on the Western Bank and Le Have Ridges also occur on Le Have Bank. Le Have was at one time (1855 to 1865) quite a favorite fishing-ground for halibut, and considerable quantities are occasionally taken now by the hand-line cod fishermen in winter, though they do not occur in sufficient numbers to warrant trawlers going there.

LE HAVE RIDGES.

The fishing-ground known as Le Have Ridges is simply a continuation of Le Have Bank to the eastward, in the direction of the Western Bank, a distance of about forty-five miles. This places the eastern limit in $62^{\circ} 50'$ west longitude, while the northern and southern boundaries are about the same as those of Le Have Bank. The extent of the ridges is about fifteen hundred and seventy-five square miles. The bottom is a succession of ridges of gravel and pebbles, with occasional patches of rocks, the depths varying from fifty-five to eighty-five fathoms. The current, though occasionally strong, is weaker here than farther west on the bank, and, excepting during easterly winds, is but little noticed. The general set is westerly. The Ridges were for a number of years one of the favorite places of resort for the halibut catchers in the winter, and many good trips of cod have also been taken there at that season. At present, but few halibut

are caught except in the deep water along the southern edge of the ground, where they have sometimes been found quite plentiful during nearly the entire year. Hake are also found in large numbers in the deep water about the edges of the ground, and even on the ridges. As a general thing, few vessels besides those from Gloucester have made a practice of fishing on Le Have Ridges, though cod-fishermen from other places stop there now and then during the summer. In the deep water bordering the southern side of Le Have Ridges, Gorgonian corals (*Primnoa*, *Paragorgia*, etc.) occur on the rocky bottoms, while on the ridges themselves sea anemones, starfishes, mollusks, crabs, and other crustaceans abound.

ROSEWAY BANK.

Roseway Bank lies north of the western part of Le Have Bank and southeast of Shelburne light, Nova Scotia. It is oblong in shape, and of slight extent (about two hundred and seventy square geographical miles), its greatest length being about twenty-one miles, and its greatest breadth about fifteen miles. It extends from $43^{\circ} 12'$ to $43^{\circ} 33'$ north latitude, and from $64^{\circ} 25'$ to $64^{\circ} 52'$ west longitude, and at the northwest corner is connected with the shore limit of sixty fathoms by a narrow neck. The depths on this bank vary from thirty-three to forty-eight fathoms, and the bottom consists of sand, gravel, and rocks.

The currents in this region are not nearly so strong as in the vicinity of Cape Sable and Brown's Bank. The general direction of the flow is about west-southwest and east-northeast, the westerly current being usually much the stronger, although the force and direction of both are more or less influenced by the winds. The principal fish taken on this bank are cod, haddock, and cusk, but hake, pollock, and halibut also occur there. The best fishing season is generally from May to October, during which time the bank is mainly resorted to by small sized vessels from the western part of Nova Scotia, although a few New England vessels also occasionally fish there.

BROWN'S BANK.

Brown's Bank lies in a northeasterly direction from George's Bank, and is separated from it by a gully fifteen miles wide, in which the depths of water range from one hundred to four hundred and fifty fathoms. This bank is imperfectly laid down on the published charts now in use by the fishermen, and no comprehensive idea of its extent and consequent importance as a fishing-ground is, therefore, conveyed by them.

The charts published by the United States Coast Survey define the boundaries of the bank much more accurately and afford a better idea of the area visited by the fishing-vessels than the Admiralty and Eldridge charts. The depths of water range from twenty to seventy-five fathoms over this area, which embraces within its limits about twenty two hundred and seventy-five square miles. The greatest length of the bank, from southeast to northwest, is sixty-three miles, and the extreme breadth forty-three miles. It is situated between $64^{\circ} 52'$ and $66^{\circ} 29'$ west longitude, and $41^{\circ} 50'$ and $43^{\circ} 02'$ north latitude. There is a small rocky shoal on the northern part (the exact location of which seems not to have been definitely determined), on which, it is said, there is not more than nine to fifteen fathoms of water. The bank slopes away from the shoal on the south and east, to depths of fifty-five to seventy-five fathoms; but at a distance of twelve to fifteen miles off it again rises to depths of thirty to fifty fathoms. This area of shoal water, within the fifty-fathom limit, is fifty miles long with an average width of fifteen miles. North of the shoal the bottom drops off suddenly to depths of seventy to eighty fathoms. The bottom is largely composed of coarse sand, gravel, pebbles, and rocks, and is rich in animal life.

The tides are quite as strong here as on the eastern side of George's Bank, the ebb having an average strength of one and one-third miles an hour, while the flood runs somewhat stronger. The greatest strength of the flood-tide sets nearly northwest, while the ebb flows in nearly an

opposite direction.

Cod, halibut, and haddock are the principal food-fish occurring on this bank, but pollock and hake are also found in less numbers. Cod are quite plentiful in the winter, and some good fares are obtained, although comparatively few vessels fish here at that season, most of them going to George's. At other seasons, however, the cod fishery on Brown's Bank compares favorably with that of any of the other banks in that vicinity. Quite a number of the so-called Georgesmen fish here, and a few resort principally to this bank during the entire year. Halibut were formerly found in abundance, but at present this fishery is limited to an occasional trip to the deep water off the southern or western edge. A small quantity of this fish is also caught by the hand-line fishermen. The haddock fishermen frequently visit this bank during the winter, and often make good catches.

SEAL-ISLAND GROUND.

Off the western part of Nova Scotia there is an important fishing locality, to which no name is given on the charts, but which is called by the fishermen Seal-Island Ground. It is a direct continuation of the shore soundings, which slope gradually from the land toward the south and west, and continue in a northerly direction beyond what might be properly regarded as the limit of the ground. To the south it extends nearly to Brown's Bank, from which it is separated by a narrow gully; to the west it reaches thirty-eight miles beyond Seal Island, and to the northwest about thirty-five miles from the same island. The southern limit of the ground is in 43° and the northern in $43^{\circ} 45'$ north latitude, while the western boundary may be placed at $66^{\circ} 40'$ west longitude. The entire ground covers an area, outside of the three-mile line, of twelve hundred and fifty square miles.

There is a small shoal called Pollock Rip, with a depth of seven fathoms, bearing southwest from Seal Island, from which it is distant nine and one-half miles, but otherwise the ground slopes quite gradually, the depths ranging from fifteen to seventy fathoms. The bottom is mainly composed of coarse gravel and pebbles, with occasional rocky spots of greater or less extent. The tides sweep out from and in toward the Bay of Fundy with considerable force, the course varying with the direction of the land, so that while they run nearly north and south on the northern part of the ground, they swing round to the southward of Seal Island and there run northwest and southeast. The flood is stronger than the ebb, and the fishermen estimate that one flood tide will carry a vessel nearly as far in a northerly direction as two ebb tides will carry it in the opposite way, although this is doubtless an exaggeration.

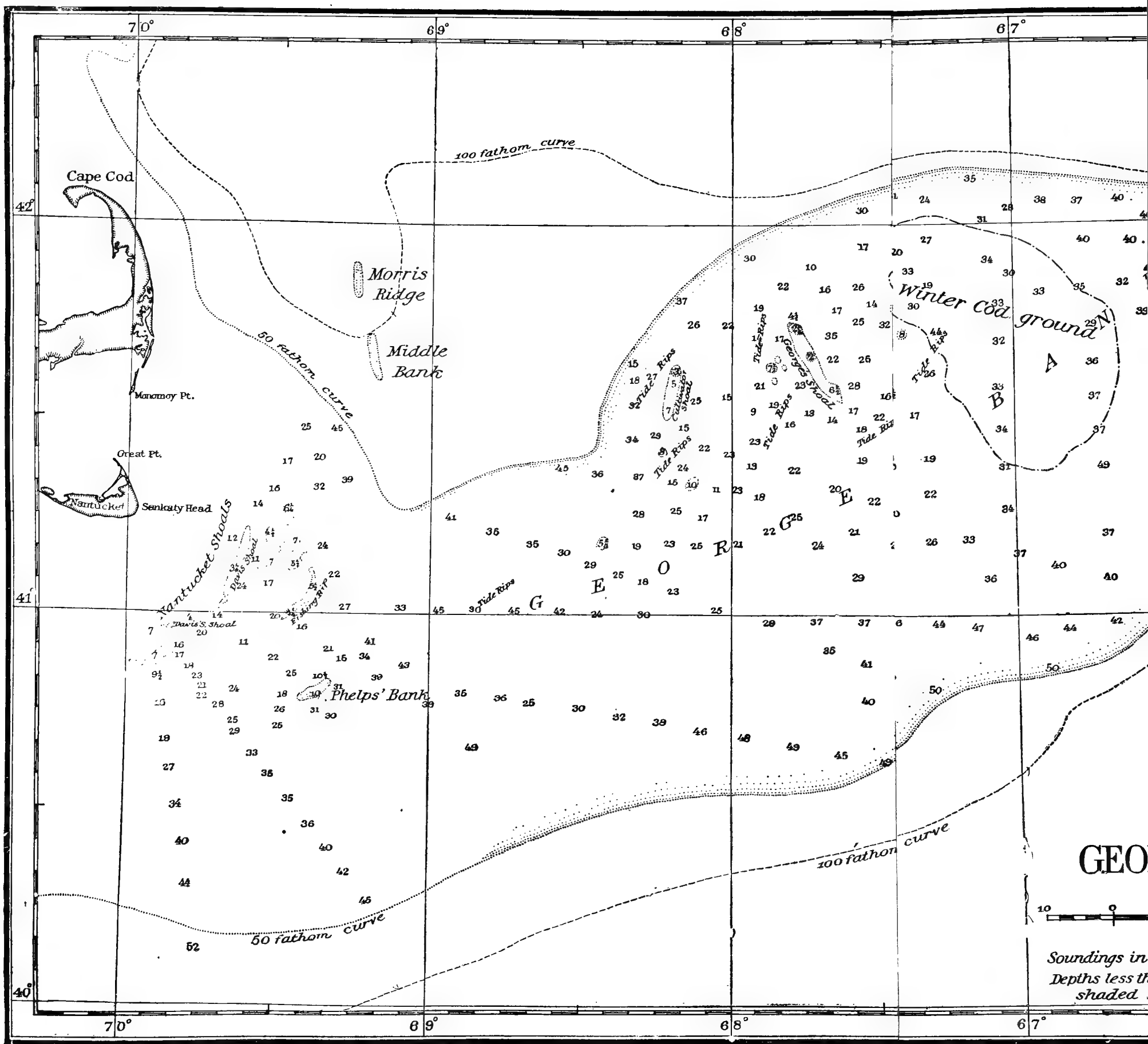
The principal fish caught on this ground are cod, haddock, and pollock; but halibut, cusk, and hake are taken to a limited extent, and occasionally herring and mackerel are netted for bait. Cod are generally more abundant from spring until fall than during the winter, but haddock and halibut occur throughout the year. Fishing usually begins in April or May, and continues until October. Halibut were formerly very plentiful in this region, but are now comparatively scarce.

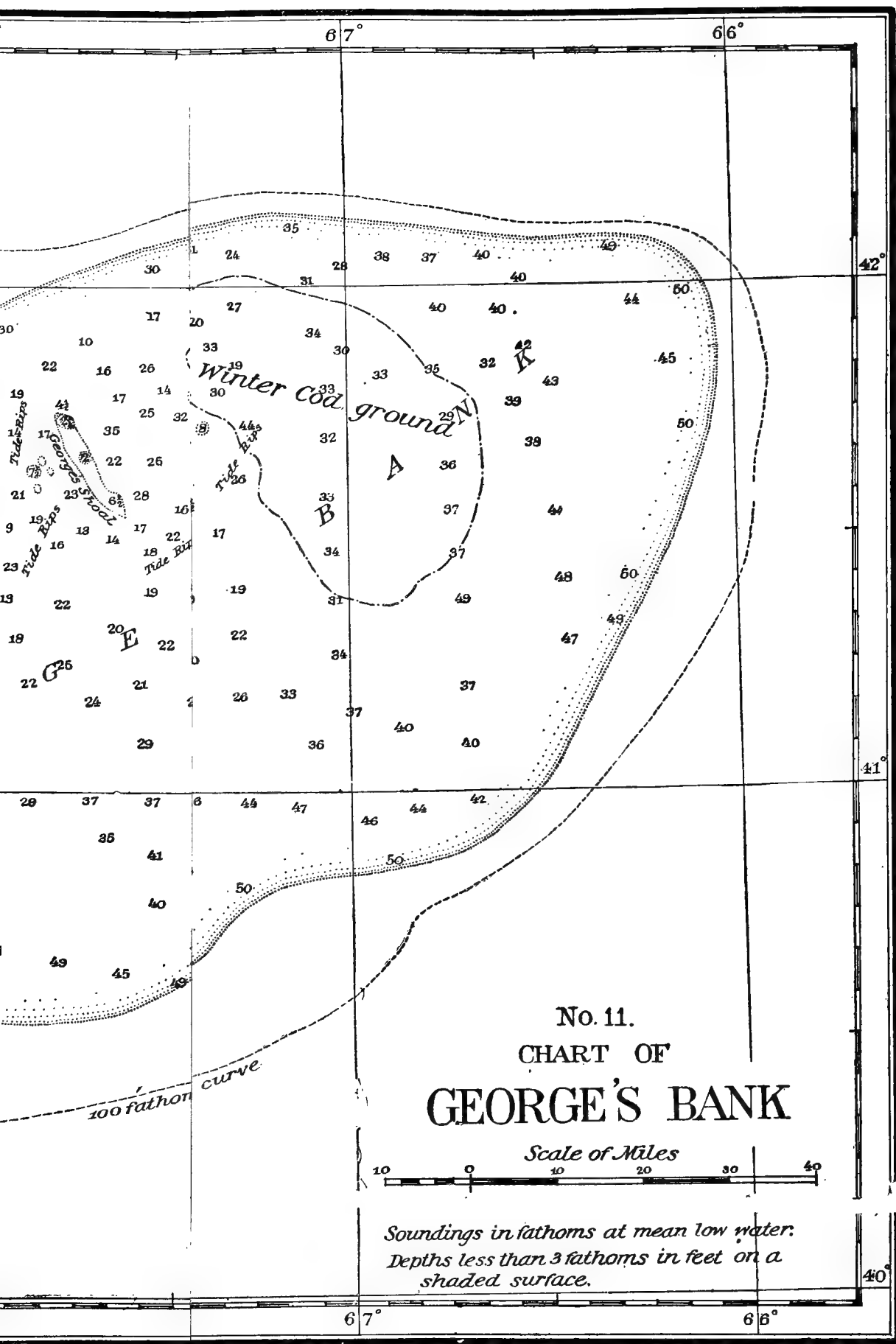
This ground may be considered as essentially a feeding-ground for cod, which appear to come here after the spawning season is over, to fatten upon the crabs and mollusks living on the bottom and the herring and other species of small fish that swim back and forth in the tide rips. All parts of the ground are fished on at the same time. This was formerly a favorite fishing

locality for vessels from the coast of Maine, but since the almost universal adoption of trawling, only a few American vessels beyond Georgesmen (hand-liners) go there. The New London halibut schooners occasionally visit it in summer. The fleet resorting there now is principally composed of vessels belonging to the western part of Nova Scotia, which generally "fish at a drift," moving back and forth over the ground with the wind and currents.

GEORGE'S BANK.

George's Bank is by far the largest and most important fishing-ground near the coast of the United States, and is second to none in the Western Atlantic except the Grand Bank of Newfoundland. It lies to the eastward of Cape Cod and Nantucket Shoals, and is apparently an extension of the latter, since the water is no deeper between the southern part of the shoals and the western part of the bank than in many places upon it. As laid down on the charts, the southern limit is in $40^{\circ} 40'$ north latitude, although the fifty-fathom line extends seven miles farther south; the southern boundary may, therefore, be regarded as in about $40^{\circ} 30'$ and the northern as $42^{\circ} 08'$ north latitude. The eastern part is in about 66° and the western in 69° west longitude. The greatest length from the northeastern to the southwestern extremity is about one hundred and fifty miles, and the greatest width north and south ninety-eight miles, according to the charts of the United States Coast Survey. The depths range from two to fifty fathoms. On the western part, between the parallels of $41^{\circ} 10'$ and $41^{\circ} 53'$ north latitude and the meridians of $67^{\circ} 20'$ and $68^{\circ} 37'$ west longitude, are a number of shoals, known as the East Shoal, the North Shoal, the Southwest Shoal, Cultivator Shoal, etc. The Southwest Shoal is the largest, being fifteen miles in length south-southwest and north-northeast, with an average width of two and one-half miles. The position of the center of this shoal is $41^{\circ} 39'$ north latitude and $67^{\circ} 48'$ west longitude. There are from two to fifteen fathoms of water on the shoals, and between them from twelve to thirty fathoms. The tides sweep over these with great force, causing strong rips, and, during rough weather, the sea breaks heavily on them, rendering approach to their vicinity extremely hazardous. The bottom is chiefly sand, although patches of rough ground—gravel, pebbles, and rocks—of greater or less extent, are found in some localities. Its position between the Bay of Fundy and the Gulf Stream causes the tides to run swifter than on the other banks, and to swirl around instead of passing directly back and forth. They sweep around the compass, from left to right, attaining the greatest velocity when flowing southeast and northwest and the least velocity when moving southwest and northeast. The first attempt at fishing on this bank, of which there is any record, was made in 1821 by three Gloucester vessels. The George's cod and halibut fishery of later date did not become fully established as a permanent industry until about 1835, although vessels went there for halibut in 1830. At first the catches consisted mostly of halibut, but since 1850 they have been chiefly of codfish, although more or less halibut are taken with them. During the months of February, March, and April large schools of cod make their appearance on the bank. They are generally found on the "winter fishing-ground," a part of the bank lying to the eastward of the shoals, between $41^{\circ} 30'$ and 42° north latitude and $66^{\circ} 38'$ and $67^{\circ} 30'$ west longitude. This is essentially a spawning-ground for the cod, which appear to come on the bank from the southeast, as they almost invariably, after reaching the ground, move slowly to the north and west as spring approaches. This is in the direction of the shoals, and, as the pursuit of the fish brings the vessels near the latter, great loss of life and property sometimes occurs during heavy easterly gales. As soon as the spawning season is over the schools of cod break up, but more or less fish are caught on different parts of the bank during the entire year, though rarely, if ever, are they found so plentiful as when the winter school is on the ground.





The codfish fleet, which numbers about one hundred vessels, is wholly from Gloucester, Massachusetts. Besides these, there are twenty-five to thirty vessels from the same port that fish on George's for haddock in the winter, and a few others, from ports in Long Island Sound, engage in the halibut and cod fishery to a limited extent in the spring and summer.

The area of the "winter fishing-ground" is about eleven hundred square miles, while that of the whole bank is eighty-four hundred and ninety-eight square miles. All of this area, with the exception of the shoals, is available for fishing purposes in the summer season for cod, halibut, haddock, and mackerel.

Various kinds of shell-fish, such as pectens, mussels, and periwinkles, and crabs, and other crustaceans abound over most parts of the bank, and herring and lant are quite plentiful during most of the year.

13. THE MACKEREL AND MENHADEN FISHING-GROUNDS OF THE EASTERN COAST OF THE UNITED STATES.

THE MACKEREL GROUNDS.

The most extensive and valuable mackerel fishing-grounds of the world are located off the eastern coast of the United States, between the parallels of 36° and 45° north latitude, and the meridians of 66° and $75^{\circ} 30'$ west longitude. They extend from a point a short distance north of Cape Hatteras (about fifty to seventy miles directly off the mouth of Chesapeake Bay) to the eastern and northern limit of the Gulf of Maine, comprising the entire extent of the latter region. The length of these grounds, in round numbers, is about seven hundred miles, and the average width may be regarded as at least eighty miles, making a total area of about 56,000 square geographical miles, all of which is resorted to by the mackerel catchers of the United States. Over this region the mackerel swarm at certain seasons in incredible numbers, although the entire region is not generally filled with schools of these fish at the same time.

In their spring migrations the mackerel approach the coast north of Cape Hatteras, and the first captures are usually made in the latter part of March or the beginning of April, between the parallels of 36° and 38° north latitude, at distances of twenty-five to seventy miles from the land. The following statements of early catches of mackerel, from 1878 to 1881, will give a comprehensive idea of the localities and dates at which the first schools make their appearance.

EARLY CATCHES OF MACKEREL IN 1878.

March 30.—Off Chincoteague, Virginia; schooner Lilian, of Noank, Connecticut.

April 16.—Latitude $36^{\circ} 10'$ north, longitude $74^{\circ} 45'$ west; schooner Sarah M. Jacobs, of Gloucester.

April 18.—Twenty-five miles southeast of Cape May; schooner Alice, of Swan Island, Maine.

April 25.—Fifty miles southeast of Cape May; schooner John Somes, of Swan Island, Maine.

EARLY CATCHES OF MACKEREL IN 1879.

April 12.—Latitude $36^{\circ} 35'$ north, longitude $74^{\circ} 50'$ west; schooner Sarah M. Jacobs, of Gloucester.

April 13.—Latitude $37^{\circ} 57'$ north, longitude $74^{\circ} 23'$ west; schooner Augusta E. Herrick, of Swan Island, Maine.

April 13.—Seventy-five miles south-southeast of Cape Henlopen; schooner S. G. Wonson, of Gloucester.

April 14.—Latitude $38^{\circ} 08'$ north, longitude $73^{\circ} 57'$ west; schooner Charles Haskell, of Gloucester.

April 19.—Latitude $37^{\circ} 50'$ north, longitude $74^{\circ} 03'$ west; schooner Alice, of Swan Island, Maine.

EARLY CATCHES OF MACKEREL IN 1880.

April 1.—Latitude $35^{\circ} 30'$ north, longitude $74^{\circ} 15'$ west; schooner Edward E. Webster, of Gloucester.

EARLY CATCHES OF MACKEREL IN 1881.

March 20.—Latitude $37^{\circ} 10'$ north, longitude $74^{\circ} 05'$ west; schooner Edward E. Webster, of Gloucester.

April 18.—Latitude $38^{\circ} 38'$ north, longitude 74° west; same schooner.

May 16.—Off Block Island; schooner Alice, of Swan Island, Maine.

As the season advances the mackerel move northward, the vessels following their migrations so far as possible. After a short period, however, the schools appear to strike the coast in a succession of waves, if that term may be allowed, and it generally results that, within a few weeks at most after the first captures have been made in the spring, numerous schools are to be met with along a considerable extent of coast, and, not unfrequently, from near the land to a distance of sixty to seventy miles off. It is often difficult for the fishermen to determine positively whether the mackerel that suddenly appear off Sandy Hook or Long Island belong to schools met with south of the Delaware a day or two previously, or whether they have just approached the coast for the first time, having come in directly from the Gulf Stream. However that may be, it frequently happens that they are taken at the same time at numerous places all along the coast from near Montauk Point, Long Island (and possibly near Block Island), to the mouth of the Delaware River, and even farther southward. It is also not unusual for catches to be made on the same day both at Cape Cod and off New York, with reports of fish in greater or less abundance at intervening localities, as off Montauk Point, Block Island, No Man's Land, and the south shoal of Nantucket, and in the south channel between George's Bank and Nantucket Shoals.

During the early part of the season, while the spring or southern mackerel fishery is in progress (usually from March 20 to June 1), a large percentage of the catch is marketed fresh, chiefly in New York. The vessels frequently meet in port, and the fishermen are thus afforded an opportunity of comparing notes, which, in consequence of the broad areas traversed in the passage to and from market, enables them at this season to correctly estimate the area covered by the mackerel as well as their abundance.

After the beginning of June, the Gulf of Maine becomes the great mackerel ground. As the schools of fish pass in the South Channel they appear to separate, a portion moving up by Cape Cod, usually not far from the land, while other schools take a more easterly course, sweeping off toward Cashe's Ledge, or even across toward Cape Sable. These various schools, which seldom have precisely the same movements two years in succession, are followed by different sections of the mackerel fleet, and at this season the vessels are scattered from Block Island and No Man's Land to Cashe's Ledge and Cape Sable. The vicinity of Block Island has frequently remained a favorite fishing-ground throughout the summer, mackerel of extraordinary size and superior quality having been taken there during this entire period. George's Bank has also been a more or less favorite locality at the same season, and, like Block Island, has been quite celebrated for the excellent quality of its fish. Owing, however, to the prevalence of exceedingly strong tides on this bank, and to the fact that stormy weather is usually of frequent occurrence in the fall, mackerel fishing is not generally carried on there after the middle of September. As the loss of seine boats,

and possibly of seines, may result from the vessels being caught out in a severe gale, the fishermen are more cautious at the present time about remaining on George's in the fall than they were formerly, when hooks and lines were the chief appliances of capture.

Mackerel are occasionally found in abundance on Brown's Bank, situated northeast of George's Bank, and on the Seal-Island Ground, but their occurrence in great numbers in these localities may be regarded as exceptional rather than as the rule. Although the movements and abundance of mackerel are subject to yearly variations of greater or less magnitude, it can be safely stated that during the months of June, July, and August, the following localities furnish the most important mackerel grounds on our coast: Cashe's Ledge and vicinity, covering an area about sixty or seventy miles across, and having Cashe's Shoal as a center; the vicinity of Monhegan Island, from near Cape Elizabeth to Matinicus Rock, and from close in shore to a distance of forty miles off shore; and the vicinity of Mount Desert Rock, from the rock to near the main land, and outward from it in all directions for distances of twenty to twenty-five miles.

In the fall, after the mackerel have begun their migrations toward the south and west, the principal localities resorted to by the fishermen are successively as follows: Off Cape Elizabeth, and about Boon Island, Maine; off Cape Ann, Massachusetts Bay, Barnstable Bay, and off the outer side of Cape Cod. Fortunately, at this season, the mackerel usually follow the trend of the shore, and strike into the larger bays which indent the coast line. This permits of the fishery being carried on with little risk, at a period when severe gales are of frequent occurrence on the New England coast, as the vessels are generally within easy reach of safe harbors.

Efforts have been made from time to time to trace the movements of the schools of mackerel after they have passed Chatham, Cape Cod, the last locality where they are generally caught in the fall, but always without success. The failure of these attempts is chiefly due to two causes, namely: first, the almost steady prevalence at that season of unfavorable weather for fishing operations; and, second, the disinclination of the fishermen, at the close of the season, to push with their accustomed vigor an enterprise which appears to promise but slight money returns at the most, and exposes them to great personal risk.

THE MENHADEN GROUNDS.

The menhaden fishing-grounds of the eastern coast of the United States extend at the present time (1883) from Chesapeake Bay to and including Long Island Sound, and, in some seasons, also include a portion of Vineyard Sound, on the southern coast of Massachusetts. They are of limited width, the fishery being rarely carried on at greater distances from land than ten to fifteen miles. Their total area may be reckoned, in round numbers, at about 5,350 square geographical miles, which can be itemized as follows: Long Island Sound and the vicinity of Block Island, 1,200 square miles; off the south side of Long Island, from Montauk Point to Sandy Hook, with an average width of fifteen miles, 1,575 square miles; off the New Jersey coast, from Sandy Hook to Cape May, 1,575 square miles; Delaware Bay, 150 square miles; Cape Henlopen to Cape Charles, with an average width of about two miles, 250 square miles;¹ Chesapeake Bay, from the capes to Tangier Sound, 600 square miles.

Formerly the menhaden fishery was carried on along a much greater range of coast, extending from North Carolina to Mount Desert, Maine. Prior to 1879 menhaden occurred in great abundance in the Gulf of Maine, and the bays and estuaries connected with it, from May to October, and the waters of that region often seemed literally alive with the numerous large schools, many of

¹ Along this stretch of coast fishing for menhaden is carried on only to a limited extent, chiefly by means of seines set from the beaches, and the area of the grounds is, therefore, very small considering their great length.

which ascended the rivers to the limit of salt water. Before the introduction of purse seines they were extensively captured in gill-nets, for use as bait by the cod and mackerel fishermen, and a large proportion of the fish taken to supply the factories of menhaden oil and fertilizers, during the early period of that industry, were obtained in the same manner. In the summer of 1879, from some unexplained cause, but presumably from the prevalence of lower average temperatures in the surface waters, the menhaden failed to make their appearance north of Cape Cod, and since then they have never returned to their former grounds in the Gulf of Maine.

Mr. R. Edward Earll, who investigated the coast fisheries of the southern Atlantic States in 1880, states that for several years previous to 1878 menhaden fishing was carried on to a limited extent in Core Sound and about Ocracoke Inlet, on the coast of North Carolina. At Oregon Inlet some menhaden fishing was also done for two or three years, steamers having been employed for the purpose during one season. A purse seine was set once from Charleston, South Carolina, but it was so badly cut by the sharks that it was never tried again.

Previous to 1878 the above mentioned stations on the coast of North Carolina marked the southern limit of the menhaden fishing-grounds, but as the catches there proved unremunerative, the fishery was discontinued, and since that time Chesapeake Bay has been the most southern region where fishing is conducted. In this locality, according to Mr. Earll, fishing begins in May and continues until October; but the fishery is neither so important nor profitable as it is farther north, both because of the less abundance of fish and their poorer quality as compared with those taken about Long Island and off the New Jersey coast.

As to the times of arrival and departure of the schools of menhaden in the several fishing-grounds, Mr. G. Brown Goode says: "The first schools appear in Chesapeake Bay in March and April, on the coast of New Jersey in April and early May, and on the south coast of New England in late April and May; off Cape Ann about the middle of May, and in the Gulf of Maine about the latter part of May and the first of June. Returning, they leave Maine in late September and October, Massachusetts in October, November, and December, Long Island Sound and vicinity in November and December, and Cape Hatteras in January.¹

Off the coast of New Jersey and the southern side of Long Island, fishing usually begins in April, and by the last of that month or early in May it is carried on along the entire coast of Long Island, although it sometimes happens that no fish are taken in this region until after the first of May. The schools generally "play" in near the coast, where the fishing steamers lie in wait for them usually at no great distance from the shores; and whenever the schools rise to the surface they are quickly surrounded by the purse seines. During May the fish move around Montauk Point and into Long Island Sound, which, during the remainder of the season, becomes the most important fishing-ground for this species on the coast. There are periods of greater or less duration, however, during which the menhaden show little or no inclination to come to the surface. At such times the steamers often cruise on other grounds, going to the New Jersey coast, or even as far as Delaware Bay. When the schools are moving south in the fall, the steamers frequently follow them as far as the Delaware, but as the factories are mostly located on Long Island Sound, these long cruises are only made when the scarcity of fish nearer home renders them absolutely necessary in order to obtain supplies. Large catches of menhaden have seldom been made at a greater distance from the land than ten miles, and, as a rule, the best fishing has been obtained within two to five miles of the land.

¹ This statement of the arrival and departure of menhaden, extracted from "A History of the Menhaden," by G. Brown Goode, 1877, p. 39, applies to the condition of the fishery prior to 1878, since which time, as above described, these fish have not visited the coast of Maine.

B.—THE SEA FISHING-GROUNDS OF THE PACIFIC COAST OF THE UNITED STATES. FROM THE STRAITS OF FUCA TO LOWER CALIFORNIA.

BY DAVID S. JORDAN.

14. THE PACIFIC COAST FROM THE STRAITS OF FUCA TO LOWER CALIFORNIA.

Except the salmon fisheries of the Sacramento and the Columbia, and the ocean fisheries in the immediate neighborhood of San Francisco, the fisheries of the Pacific coast exist only as possibilities. For the most part only shore-fishing on the smallest scale is done, and no attempt is made to discover off-shore banks, or to develop them when discovered. The present report can, therefore, only discuss the places where fishing is now actually carried on.

South of Monterey the entire coast is made up of alternations of rocky headlands (rincones), usually of sandstone, with long curves of sandy beaches, and is broken by occasional large and small bays (esteros and lagunas). The immediate neighborhood of the shore has almost always a sandy bottom, and is not very rich in either animal or vegetable life. Farther out, at varying distances, is a belt of rocky bottom, thickly covered with the great kelp (*Macrocystis pyrifera*), and beyond this there are occasional rocky reefs, usually continuous with the rincones on the shore and with the rocky islands, which have the same origin.

About these headlands and on the reefs some still-fishing is done, mainly for species of rockfish (*Sebastes*), and occasionally a gill-net is put down. The best known of these reefs are about the islands of Santa Catalina and Anacapa, but they doubtless exist around all of the islands in this region, which are mostly situated at a distance of about twenty miles from the shore. The middle parts of the channels between are, in summer, the resorts of the large migratory fish, which are caught in considerable numbers by trolling. Along the sandy beaches seining is practiced, and gill-nets of little depth are set to catch the common shore-fishes (largely surf-fish, roncadors, and flounders). In the bays of sufficient size seining is largely pursued, especially by the Chinese. In some of the smaller bays the oil-shark (*Galeorhinus*) breeds, and is taken by hook and line. Certain fishes (redfish, whitefish) are also taken in large numbers by still-fishing along the line of the kelp.

From Monterey to the mouth of the Columbia the coast is quite similar, but it is in general more rocky, with less sand, and presents an additional feature in the existence of rivers of considerable volume and more deeply indented bays. In all of these rivers there is a greater or less run of salmon in the fall, and in those fed by snow water, in the spring also; and in many these fish are taken for market purposes, in nearly every case by the use of gill-nets. The number of rocky reefs seems to increase to the northward, and the number of species inhabiting them is greater, so that both in Monterey Bay and about the Farallone Islands baited trawl-lines

are largely used for taking rockfish. In the bays seines are extensively used. Trolling and still-fishing in the kelp are little practiced, because the fishes caught in this way are mostly southern in their range. Between the rocky headland of Point Reyes and the entrance to the Golden Gate is a long stretch of smooth sandy bottom at a considerable depth. The bottom here swarms with flounders, and a mode of fishing is pursued analogous to the trawl-net fishing of the Atlantic—the fishing of the Paranzella. This mode of fishing is doubtless possible outside the kelp at many places along the coast, but the markets elsewhere are too small to make it profitable, excepting on a few small reefs in the neighborhood of the Farallones where rock-cod abound, and at the mouth of Monterey Bay; and, beyond this stretch of deep water now fished by the Paranzella, we can hardly say that any definite off-shore fishing-grounds exist south of the Straits of Juan de Fuca. Off the mouth of the Straits of Fuca, about eight miles northwest of Cape Flattery, there is an extensive halibut bank, where the Indians take halibut in large numbers, and which may some time become of importance to the white people.

The channels among the islands in Puget Sound and to the northward are resorted to by dogfish (*Squalus*), and the bays at certain seasons swarm with herring. In Alaska many banks frequented by halibut and cod doubtless exist, but thus far the only ones developed to any considerable extent are about the Shumagin Islands.

C.—THE FISHERY RESOURCES AND FISHING-GROUNDS OF ALASKA.

BY TARLETON H. BEAN.¹

15. THE FISHERY RESOURCES OF ALASKA.

The Territory of Alaska has seventy-five species of food-fishes, seven-eighths of which are strictly adapted to the use of man, the balance being more suitable for bait. More than one-half of this number are widely distributed. More than two-thirds of the whole number exist in great abundance where they occur.

The flat-fishes and flounders (*Pleuronectidæ*) have representatives on all parts of the coast; the number of species is, however, smaller north of Unalashka than is found around the shores of the Gulf of Alaska and its groups of islands.

The codfishes (*Gadidæ*) are equally divided between Southern and Northern Alaska, the southern species excelling the northern in size; of these the pollock is one of the best baits known for cod.

There are thirteen species of sculpins (*Cottidæ*), nearly all of which are important as food, the scaly sculpins (*Hemilepidotus*) being especially good.

Although the number of species of *Sebastichthys* is much smaller than on the Californian coast, the five that do occur in the waters of Southern Alaska are all excellent, and two of these are known from as far north as Kodiak.

The so-called "rock-cod" (species of *Hexagrammus*) rank with the preceding in good qualities, and they are extremely abundant, some species reaching as far north as Port Clarence; *Hexagrammus asper* of Steller is found all along the coast from Sitka westward to Attu. These fishes are generally known to the Russians and largely to the Aleuts as the "tor-poog"; one species (*H. ordinatus*, Cope) is the "green-fish," so called on account of the green color of its flesh, which is nevertheless quite palatable; the green color disappears in the process of cooking; the "green-fish" is remarkable for another peculiarity in its smoky brown ova. One of the most important members of this family of *Chiridæ* is the "striped fish," "yellow-fish," or "Atka mackerel," *Pleurogrammus monopterygius* (Pallas) Gill, which, besides its own intrinsic value as an edible fish, possesses rare worth as a bait for cod.

The family of *Trachinidæ* is represented by one species called "cusk" at the Shumagins, a fish which was too rare in museums for us to try its table qualities, although it forms an element in the bait-supply for cod.

¹The report of Dr. Bean might, with almost equal propriety, be included in the section devoted to the methods of the fisheries, but since it is in the main a discussion of undeveloped resources it is deemed more fitting to include it in the section devoted to the fishing-grounds.—G. BROWN GOODE.

There is one species of sand lance or "lant" (*Ammodytes personatus*) which is extremely abundant in most parts of Alaska, and extends north to Point Belcher, as we certainly know; this lance is largely useful in the cod fishery and in general hook-fishing in Southern Alaska as well; its abundance is wonderful.

The pike (*Esox lucius*, L.) we have from Slave Lake; it is "common in all the lakes and ponds of . . . Northern Alaska, but absent from the rivers. It is caught with seines in summer and early winter. It is principally used for dog-feed, being of little value for the table."¹

The family *Microstomatidae* as distributed in Alaska includes the smelts (two species), the capelin, the surf-smelts (two species), and the eulachon. The smelt, which is most abundant and important, resembles the common species of the Atlantic seaboard very closely; it may be, too, that the second form, which is remarkably slender posteriorly, is merely the spent female of the first. The distribution of these fish is probably northerly, as the National Museum has no examples from any point south of Saint Michael's; Steindachner, the describer of *Osmerus dentex*, had it from De Castrie's Bay. We obtained, September 6, 1880, from Eskimo, in Eschscholtz Bay, dried smelt which they had prepared for food. The capelin (*Mallotus villosus*) is universally and abundantly present throughout the Territory; it plays a very important part in the salmon and cod fishery, forming as it does the principal food of these fishes during a part of the summer. Young capelin are extremely abundant north of the Arctic circle, but we have not seen them in Southern Alaska; the number annually consumed by cod and salmon must be enormous. I have taken forty from the stomach of a single cod on Portlock Bank; salmon may be seen in pursuit of capelin even in the brackish waters where small streams fall into the bays and coves. The species of *Hypomesus*, though of small size, form a considerable portion of the food-supply; one of them is known in southern waters (*H. pretiosus*); the other, instead of spawning in the surf like its southern congener, runs into fresh-water ponds to perform this function, and seems to be confined to Northern Alaska and Northeastern Siberia. A well-known representative of the family of *Microstomatidae* is the eulachon or candle-fish (*Thaleichthys pacificus*), an inhabitant of the shores of the whole Gulf of Alaska. The uses and the mode of capture by Indians of surf-smelts and eulachon are so well explained by Mr. Swan in the "Proceedings of the National Museum,"² that it is unnecessary to add anything to that portion of the subject. Eulachon have been salted at Katmai on the peninsula of Aliaska and brought to Saint Paul, Kodiak. Mr. B. G. McIntyre, who gave me information concerning this industry, and furnished some examples of the product, speaks highly of the table qualities of salted eulachon. Unfortunately there is no harbor at Katmai, else it might become the seat of an important trade in this article.

The whitefishes (*Coregonidae*) form one of the great staples of food in Northern Alaska (from the Yukon northward), replacing the salmon almost entirely in the extreme north. There are five species of *Coregonus*, the largest of which, as represented in the collections of the National Museum, was once considered identical with the common *clupeiformis*³ of the Great Lakes; it is the fish for which Milner proposed the name *Kennicotti*, and is quite distinct from the *clupeiformis*; this is the "Broad Whitefish" of Mr. Dall, which he says: "Is the next in size of the Alaska

¹ DALL, in Report of the Commissioner of Agriculture, 1871 (for 1870), 387.

² Vol. III, pp. 43 and 257.

³ *Stenodus Mackenzii* is the species referred to by Mr. Dall in the "Report of the Commissioner of Agriculture for 1870," page 386, as the "Great Whitefish," concerning which he says: "This enormous whitefish is the finest of its tribe, both in size and flavor." It is found in the rivers most of the year, but is most plentifully obtained and is in its best condition about the months of June and July. We have seen them four feet long and weighing about fifty pounds. It is distinguished by its long nose and slender form, and is of a silvery white, somewhat darker above. It is full of spawn from September to January, when it disappears."

whitefish, and reaches a weight of thirty pounds. It is distinguished by its broad body, short head, and large scales. It is usually very fat and excellent eating. It abounds in both winter and summer, spawning in September in the small rivers falling into the Yukon."¹ The "Round-fish" of Mr. Dall's paper is *Coregonus quadrilateralis*, Rich. "A long, slender, subcylindrical fish, not very abundant, but of excellent quality. They are caught occasionally throughout the winter on the Yukon, and are distinguished by their attenuated muzzle and peculiar form." The "Humpback" of Mr. Dall is related to *clupeiformis*, from which it is separated by its arched and compressed back. The "whitefish" (Russian *Morskoï ciga*) is *C. Lauretta*, Bean. Mr. Dall says of the *Morskoï ciga*: "This is the most abundant and best flavored species of *Coregonus* in most localities. It is distinguished by its small scales, fins, tail, and head, and is of symmetrical proportions and moderate size. It rarely exceeds three pounds in weight, and is the staple article of food in winter on the Yukon."¹ *Coregonus Lauretta* is the prevailing species of the far north; the writer obtained it in Port Clarence while in company with the United States Coast and Geodetic Survey Expedition to Alaska, in 1880, and Capt. C. L. Hooper, commanding the Revenue-Marine steamer Corwin, thus records it from Point Barrow in his report to the Treasury Department of November 1, 1880:

"The temperature of the water was 40° F. We bought from the natives some eider ducks, which were found to have a strong fishy taste, and some fish resembling shad, but smaller and very fat; they differ also from the shad in having two double [misprint for dorsal] fins. We saw the same species in Kotzebue Sound and at other places within the Arctic circle. They are called by the natives 'tupook.' I preserved some specimens for the Smithsonian Institution."

The "Nulato whitefish" (Russian "*Nulatoski ciga*") is evidently what I have called in my list of Alaskan food-fishes *Coregonus Merkiti*, Günther, variety. This is a small, thin, bony species, common near Nulato, on the Yukon, and is rarely more than half a pound in weight. It is of little use as food, and is principally abundant in summer. Captain Hooper forwarded to the Smithsonian Institution many specimens of this whitefish, which he obtained doubtless in Kotzebue Sound and elsewhere in the Arctic regions. The grayling or blanket-fish concludes the list of *Coregonidae*. Of this Mr. Dall has written as follows:

"Abundant in the small rapid rivers of Alaska. It is the only fish in the Yukon territory which will take the hook. It is of moderate value only for table use, and is especially abundant in spring when the whitefish begin to be scarce."

The greatest fish wealth of Alaska lies in its abundance of fine salmon, so far at least as shore-fishing is concerned. There are five species of *Oncorhynchus*: *chouicha*, *keta*, *nerka*, *kisutch*, and *gorbuscha*—all readily distinguished one from the other by well-marked characters, except the first two. Three of them may be at once recognized by a single character even; *gorbuscha*, for example, has much smaller scales than any other species; *kisutch* has a much smaller number of pyloric cæca than all the rest; *nerka* has much the largest number of gill-rakers; *chouicha* is the giant of the group, and may well be called the "king salmon." This is the largest and finest of the Alaska salmon, reaching a weight of sixty to ninety pounds. Those weighing eighty pounds are not uncommon, and others weighing a hundred-weight have occasionally been taken. This fish, or a fish called by the same name, ranges from Sitka to Bering Strait, and is found in all water-courses from the tide-ways of the Alexander Archipelago to the broad current of the Yukon. It ascends the latter river for at least twelve hundred miles and perhaps farther. It is a short and broad fish, with a large head, but comparatively small mouth and fins. It reaches

¹ DALL, *loc. cit.*

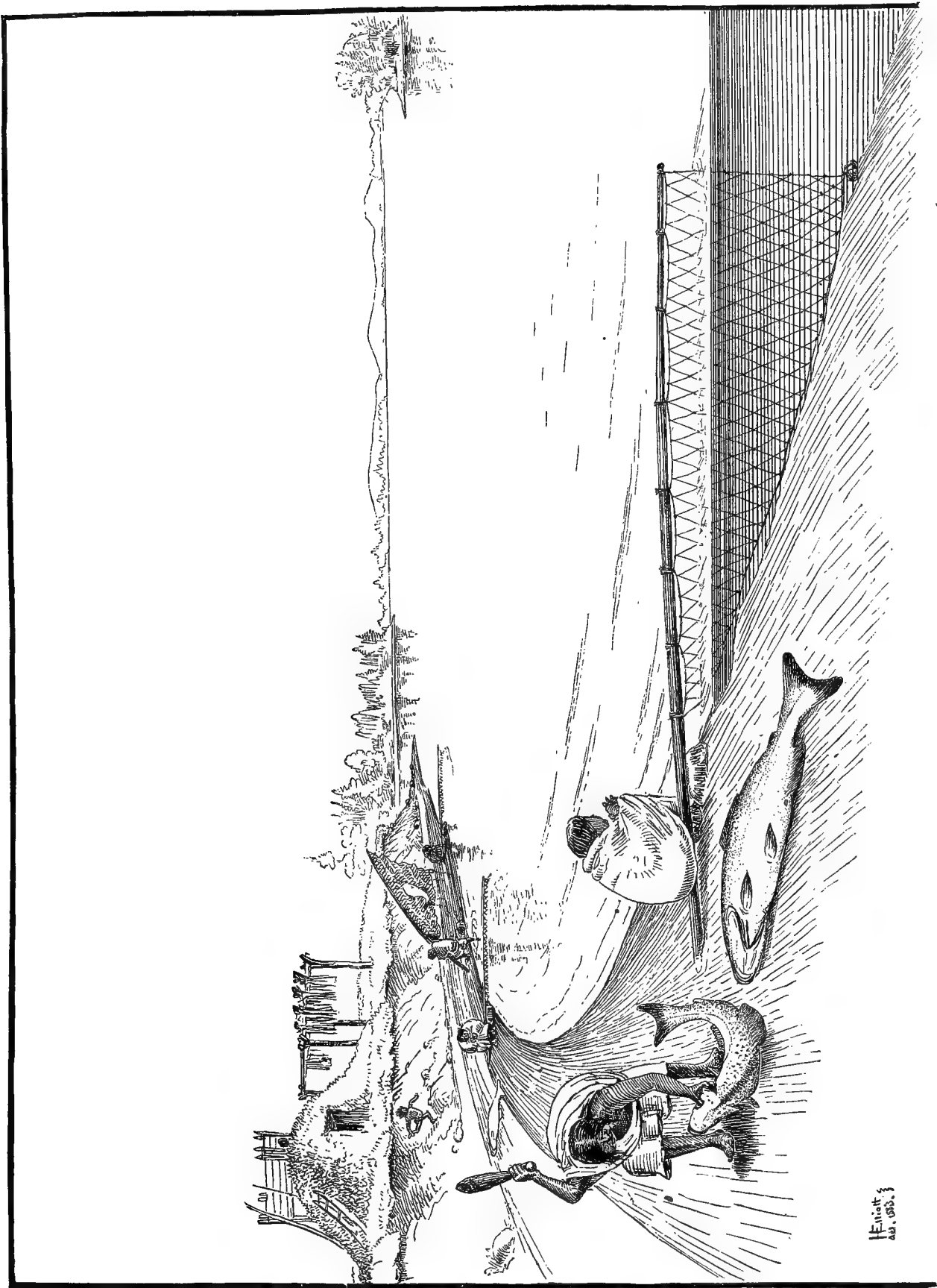
the mouth of the Yukon about the middle of June, and runs for six weeks. It ascends the river slowly, reaching Fort Derabin (about three hundred and sixty miles above the mouth of the river) about the first week in July, and Fort Yukon (about one thousand miles above the mouth) about the middle of July. It is dried for winter use by the natives. All dry fish is called *ukali* by the Russians. The chowichee *ukali* are made by cutting the fish in three slices after removing the head, leaving the backbone in the middle slice, and all three connected by the tail. Two or three dry chowichee *ukali* will weigh at least fifty pounds. One of them is accounted sufficient for a day's food for six men or dogs. They cost, from the natives upon the Yukon, one leaf of tobacco each, or, when dry, five to eight musket-balls per *ukali*. The more northern the ground where the fish are taken, the finer their flavor, and the chowichee of the Yukon were held in such esteem that several hogsheads were annually salted for the emperor's table by the Russians.¹

It is now believed that the famed "chowichee" and the "quinnat" salmon known to fish-culturists and anglers are one and the same species. The maximum size of this "king salmon" is so great as to be almost incredible, and yet there is no doubt that individuals weighing one hundred pounds have sometimes been taken. Mr. B. G. McIntyre, at Saint Paul, Kodiak, had one that was smoked by Capt. James Wilson at Fort Kenai in 1879, which weighed sixty-six pounds in its cured state; this must have weighed fully ninety pounds in the fresh condition. Capt. H. R. Bowen states that he brought one down from Kassilov that weighed eighty-four pounds after smoking, with head, fins, entrails, and half of the backbone removed. Mr. Thomas Devine told me that a silver salmon five feet long was brought to Pirate Cove, Shumagins, in 1877; this must have been *O. chowicha*. Rufus Bordukofsky claims that he has seen a chowichee salmon seven feet long at Iliuliuk, Unalashka. This seems a little too long, but I mention it as an additional confirmation of the enormous proportions reached by the species. I have been informed by Capt. E. P. Herendeen and Capt. H. R. Bowen, both of whom have caught the "king salmon," that they do not run in schools, but two or three together, keeping very close to the banks, perhaps to escape from the beluga. Of *kisutch* and *keta* (hoikoh) Mr. Dall says:

"These two species have the same range as the king salmon, and are dried for food in the same way. They are, however, much more common, much smaller, and are held in less esteem. They form the bulk of the better class of salmon in all the rivers of Alaska. They arrive later than the king salmon, remain longer, and travel more rapidly. They reach Fort Derabin upon the Yukon about the tenth of July, and Fort Yukon early in August. They weigh from ten to thirty pounds, and dry, after cleaning and removing the backbone, to about two or three pounds. They are more slender than the king salmon, and the males are furnished in the breeding season with a formidable array of recurved teeth, so that the natives are accustomed to knock them on the head with a club before attempting to remove them from the nets."

I noticed that the Aleuts almost invariably broke the skull of salmon, which they carried in bidarkas, near its junction with the vertebræ; this was done to kill them quickly and prevent their struggling after being stowed away. The "redfish" (*O. nerka*) and the "dog fish" (*O. gorbuscha*), Mr. Dall observes, "are principally valued for use as dog-feed. They are placed in the order of their quality as articles of food. . . . They are . . . exceedingly common, of small size, and appear later than the previously mentioned varieties. The redfish, as its name denotes, is partly of the most brilliant scarlet, but its flesh is not so red as that of the king salmon or the hoikoh (*O. keta*). They arrive in July and disappear late in August." This estimate of the redfish agrees perfectly with the opinion of Captain Bowen, who thinks it is the

¹ DALL, in Report of Commissioner of Agriculture for 1870, pp. 382 and 383.



Eskimo squaws gill-net fishing for salmon. Yukon and Kuskokvim Rivers.

Drawing by H. W. Elliott.

poorest salmon salted, though it sells best on account of its red color. For my own part I think the fresh *gorbuscha* equal to any other salmon, but I prefer the chowichee bellies among the salt fish. There is nothing on the west coast which exactly corresponds with the Maine salmon. *Salmo Gairdnerii* is most like it in general appearance, and sometimes approaches it in size, but its habits are different, since it is found filled with ripe ova in June. We have this species from Sitka and Kodiak. It is very difficult to distinguish Gairdner's trout from the "rainbow trout" (*S. irideus*), so well known in the McCloud River, the characters which are supposed to separate them being unimportant. I found at Sitka one young trout which may be called *irideus* or *Gairdnerii* indifferently, and it will puzzle any one to tell which it really is. Clark's trout (*Salmo purpuratus*) is very abundant in Southern Alaska, and must be rare to the northward. Dall says that it is not found north of Aliaska Peninsula. Captain Hooper had it from Northern Alaska, but the exact locality is not stated. This beautiful species is not known to reach the great size in Alaska that is claimed for occasional individuals in the Columbia River, but it is very abundant and an excellent food-fish. We found it feeding on sticklebacks (*Gasterosteus microcephalus*, Girard) in Piseco Lake at Sitka. The species known in California as the "Dolly Varden" trout is everywhere present in Alaska, reaching as much as fifteen pounds in weight, and literally swarming in the streams and adjacent tidal waters. The young of this trout were found as far north as Cape Lisburne, and the species is very abundant in Northeastern Siberia. While it remains in the streams it is generally dark colored, but after a sojourn in the sea upon re-entering the brooks and rivers it quickly shows its beautiful red spots. We found that individuals taken from the salt water showed no trace of red spots, but immediately assumed them upon being immersed in spring water. This difference of color, varying with the place of residence, has led to the supposition that they represent two species, the large silvery ones in the coves and bays being called salmon trout while the smaller inland form is known as brook trout. There is good evidence of the occurrence of one species of *Oncorhynchus* (*O. gorbuscha*), the little humpback salmon, in Colville River. Captain Hooper reports that "the salmon is the only variety of fish in the Arctic that is of any value. Although smaller than the salmon caught farther south, they are of fine flavor. They are quite plentiful, and the coast natives cure large quantities of them by smoking and drying for winter use."¹ Capt. E. E. Smith, who was the Corwin's ice pilot on her cruise of 1880, in 1875 put up in salt two barrels of little *gorbuscha* which he bought at the mouth of Colville River.

The sole representative of the herring family of much importance as a source of food is the *Clupea mirabilis* of Girard, the common sea-herring of the Pacific coast. Widely distributed and extremely abundant, invaluable as bait and delicious on account of its fatness, it deserves a high rank among the staples of Alaskan waters. There are no finer herring anywhere than may be seined at Iliuliuk and sometimes near Saint Paul. They are as plentiful as menhaden once were in Peconic Bay, so plentiful that a lazy Indian with a stick armed with pointed nails can soon impale a canoe load; vessels have sailed for hours through shoals of them which seemed unending; acres of grass are sometimes covered with their eggs when a high tide takes them far ashore and the receding waters suddenly leave them aground. Natives are very prompt to profit by such accidents. When we came into Chugachik Bay, in Cook's Inlet, we found a sand spit strewn with recently stranded herring and their wasted eggs, while here and there were groups of poles selected from driftwood on which the fish had been hung up to dry after being split and having the head of one passed through the gills and mouth of another. The spawn clinging to blades of grass after a little sun-drying had a rather pleasant, slightly salt taste.

¹ Report of cruise of Corwin, November 1, 1880 (1881), p. 68.

The sucker family (*Catostomidæ*) has but a single species so far as known, and that is apparently identical with the long-nosed sucker of the Great Lakes and the Upper Mississippi. This fish is abundant in the Yukon and other large rivers in Northern Alaska. It is of moderately large size, reaching five pounds in weight. It is generally of a reddish color. The body is so full of bones that it is unfit for food, but the heads, when boiled with the roe, make a very palatable soup. These fish are filled with spawn in April, a period when other fish appear to be out of season.¹

There is one lamprey known to us from Alaska, the *Ammocetes aureus* of Bean. This one is extremely abundant in the Yukon, according to Mr. L. M. Turner, and is used for food. Mr. Turner's specimen was taken at Anvik (latitude 63 north, longitude 160 west from Greenwich).

16. A REVIEW OF THE ALASKAN FISHING-GROUNDS BY DISTRICTS.

I have been thus explicit in naming the food-fishes of the Territory and tracing their distribution, in order that their importance as a means of subsistence for the inhabitants may be fully appreciated. All parts of the coast of Alaska are abundantly supplied with fish, and every male native of suitable age is to be considered a fisherman—one who employs the best expedients within his reach for the capture of fish, because his very life depends in great measure on that supply. Even the women and children help to increase the store for winter, tugging away bravely at great strings of salmon or other species caught in the seines by the men. Whenever there is any pulling of this kind to do, you may see them skirting along the shore, half floating the burden near the water's edge. The total number of fishermen estimated for Alaska in Census Bulletin No. 176 is fifty-six hundred and fifty, which is certainly not too high. According to Petroff's preliminary report on the population of that Territory, there are about thirty thousand inhabitants, distributed as will be seen in the following table:

POPULATION OF ALASKA.

[From Petroff.]

Southeastern Alaska.....	5,517
Estimate of Prince William Sound.....	500
Kenai Mission or Cook's Inlet district.....	984
Interior division.....	2,226
Kadiak Parish.....	2,606
Belkofsky Parish.....	669
Unalashka Parish.....	1,392
Bristol Bay division.....	4,340
Pribylov Islands.....	390
Saint Lawrence Island (estimated).....	400
Nunivak Island (estimated).....	500
Kuskokwim division.....	3,654
Yukon delta.....	2,006
Uphoon mouth to Anvik.....	1,345
Coast of Norton Sound from Saint Michael's upward and as far as Sledge Island.....	633
King's Island to Point Barrow.....	2,990
	<hr/>
	30,152

¹DALL, in Report of Commissioner of Agriculture for 1870, p. 388.

Leaving out the interior division, and supposing that one-fifth of the whole population are adult male fishermen, we shall have about the number estimated in the Census Bulletin. Bearing in mind the great abundance of fish everywhere, and the wasteful habits of a people who neither profit by the hint of prosperity nor take warning from the kick of adversity, we may form some idea of the millions upon millions of fish annually taken in Alaska. There are not fewer than twenty-eight thousand people in the Territory who live largely upon fish, fresh during half of the year or less, and in the form of *ukali* during the balance of the year. In the absence of records to show the amounts actually put up for winter use, we must depend upon estimates. Mr. William J. Fisher, of Saint Paul, Kodiak, has very carefully inquired into the matter, taking counsel with parties who are in the business of preparing *ukali* for consumption, and observing the quantities put up by natives for their own use. Mr. Fisher has given us the following result of his investigation:

"The annual supply of dried salmon (*ukali*) put up by a native family, consisting of two adults and two children, is estimated at fifteen hundred fish, averaging about five pounds each before being dried, and, when cured, averaging about one-half pound each. The Creoles (native whites), in addition to the above, put up about six barrels of salt fish for winter consumption. These stores are not touched until the beginning of November, when, owing to inclemency of the weather, the catching of fresh fish has to be suspended. By the first of May, when the weather permits fishing again, these stores are generally exhausted. The dried fish or *ukali* is used to a great extent in lieu of bread. In addition to the above supplies, each family adds about one-half barrel of salmon spawn, more or less, to their winter stores."

I take this estimate of the quantity of fish consumed on the island of Kodiak as the basis of a calculation for the whole Territory, because the supply, as shown on previous pages of this account, is ample on all portions of the coast; Mr. Fisher's statement, moreover, agrees with all the information we have concerning the region. On the above basis each one of the population will consume at least seven hundred and fifty fish annually, the supply of *ukali* lasting only six months and being replaced by fresh fish during the rest of the year. At the low average weight of five pounds we have the equivalent of thirty-seven hundred and fifty pounds of fresh fish per year for each person, and twenty-eight thousand people at the same rate will eat one hundred and five million pounds of fish. The first cost of fish is about one-half cent per pound, so that the yearly supply of the Territory represents five hundred and twenty-five thousand dollars.

We will now consider the different divisions adopted by Mr. Petroff, giving an account of the number of fishermen, the kinds of fish, and the modes of capture and preservation.

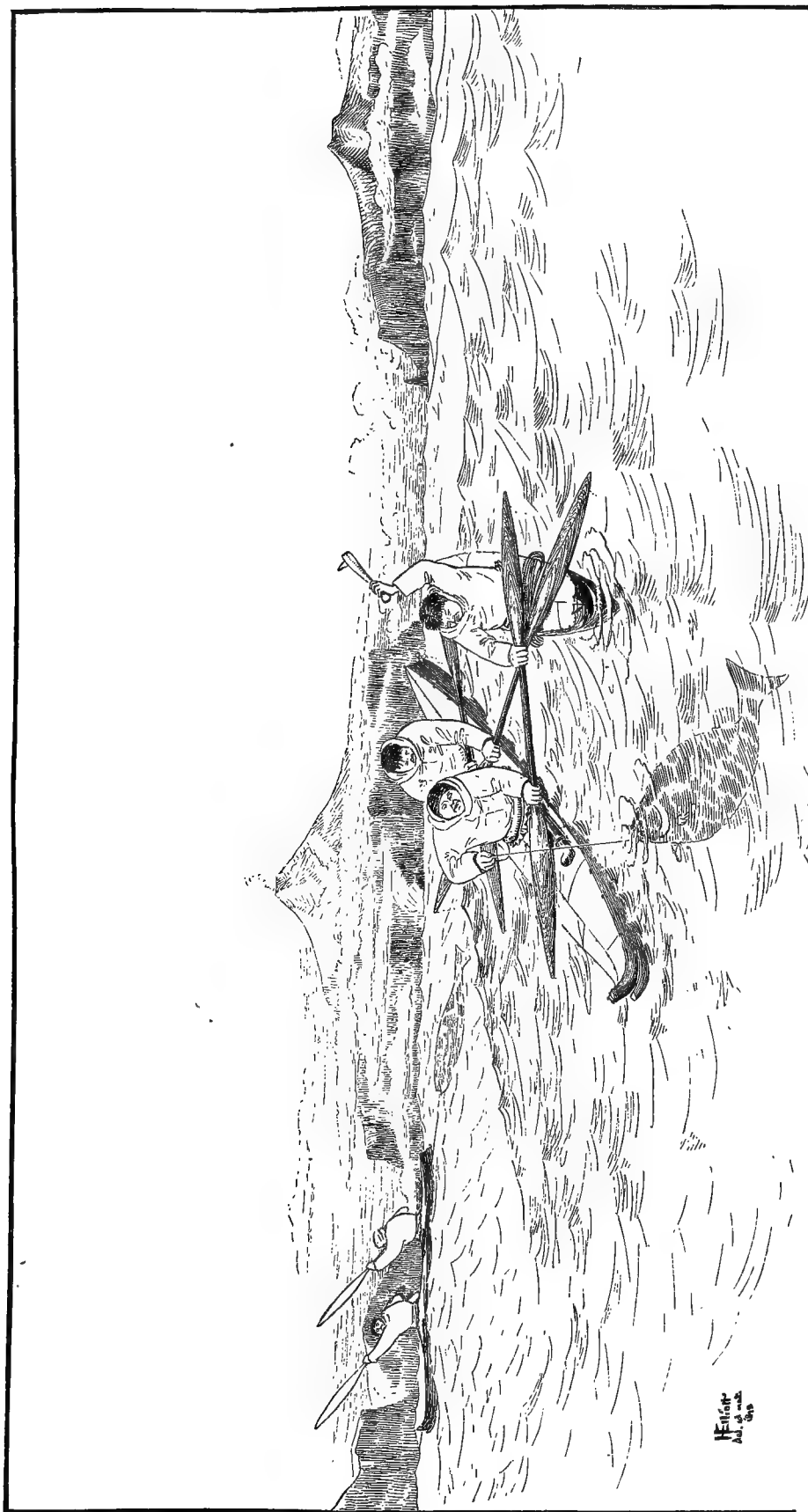
SOUTHEASTERN ALASKA.

There are at least as many as eleven hundred adult Indian fishermen in this division, who devote themselves wholly or in large part to the business of fishing for a livelihood while the season lasts. Our own observations began at Sitka, continuing there from May 28 to June 16, 1880. During this time the fishes most frequently seen in canoes and offered for sale were the halibut, several species of rock-fish, sea trout or bass, cultus cod, common cod, Gairdner's trout, red-spotted trout, Clark's trout, "hoikoh" salmon, and "keezich" salmon. In hook-fishing, which is the common method, sand lance and herring are generally used for bait. At Sitka abalones are abundant and are eaten raw by Indians. Some Chinamen, belonging to the "Jamestown," were drying large quantities of them for export to China. Delicious clams (a species of *Saxidomus*) are extremely plentiful, and form an important part of the Indian diet. The Indian village at Sitka for our purposes may be taken as the type of such villages throughout the region under

discussion. The solid log-houses here are built convenient to the water's edge. Between the houses and the water may be seen the dug-out canoes and the fish-drying frames; here and there are hung the bark fishing-lines for halibut furnished with their clumsy but effective hooks. Some very good illustrations of the Sitka halibut hooks, furnished by Commander Beardslee, U. S. N., appear in *Forest and Stream*, of 1879. The hook consists essentially of two pieces of wood fastened together at one end with strips of spruce roots so as to form an acute angle with each other, the longer arm of the angle being armed with a bent, pointed piece of iron; the wood is generally carved so as to represent some animal whose co-operation thus secured will insure successful fishing. The bait (usually herring) is tied on so as to cover not only the hook but also the wooden shaft in which the hook is fastened; halibut will gulp down the bait as long as it lasts, opening their jaws wider and wider; the short arm of the hook, being so fixed as to leave only a narrow space between it and the iron point, will admit of the motion necessary to fasten the fish, but prevents its escape. A halibut thus held with its mouth wide open will soon be drowned, and can easily be taken into a canoe. This Indian style of halibut hook is much more effective than the common halibut hook of civilization. A very common method of fishing for halibut at Sitka is by the use of set-lines, each provided with one hook, a stone sinker, an inflated stomach of seal for a buoy, with a small flag or signal attached to it so as to show when a fish is hooked. It is usual to see these lines set in ten to twenty fathoms of water off the numerous inlets of Sitka Bay. Salmon are caught by trolling with herring bait, by seining, and by spearing. Edgumbe trout (Ah-shut of the Sitkas), *Salmo Gairdnerii* Rich., were taken by the spear on their way out (?) from Lake Edgumbe to the sea in June. Herring are caught in great quantities by impaling them on pointed nails fastened into a long, thin strip of wood. The process of collecting herring eggs, by receiving them on spruce boughs, is too well known to need description here. The prevailing fish on the drying-frames at Sitka was halibut. This was cut in strips and dried partly in the open air and partly by smoking in the dwelling-houses. The fire is made in the center of the space inclosed by the walls, there being no floor covering this portion, and the smoke escapes through a wide opening in the roof. A frame of poles supports the strips of fish to be smoked. Very little fire and a great deal of smoke are the requirements. Besides fish, it is common to see viscera and other portions of porpoises hanging on the poles. The price of fresh fish at Sitka is usually about one-half cent per pound. Halibut ranged from twenty to seventy-five pounds in weight during our stay; we were told, however, by Mr. Whitford, that he has seen two caught in the harbor, one weighing two hundred and fifty-six and the other two hundred and sixty pounds.

I am indebted to Mr. George Hamilton, of Chacon, for the following information about halibut at Klawack:

Their average size is about fifty pounds; they are not brought in plentifully from November to March, but they are abundant during the rest of the year; Indians do not fish for them much in the winter; they are caught with the Sitka style of hook with kelp or bark lines, or sometimes eastern cod and halibut lines. Squid bait (*Octopus*) is preferred. The fishing is done in from ten to twenty fathoms of water. For the cannery, Indians go off in the afternoon and bring in the fish on the following morning. They will average eight or ten halibut to a canoe, having in it two persons who use not more than three or four hooks. The price at Klawack in 1878 was one-half cent per pound, which, unnecessarily and through mistake, was increased in 1879 to one and one-half cents. The amount canned in 1878 was two hundred or three hundred cases in two-pound cans, there being two dozen cans in a case. These were shipped to Sisson, Wallace & Co., San Francisco. Mr. Hamilton has seen more halibut in the vicinity of Warren Island than



Volcano of Akootan.

Aleuts catching halibut at the mouth of Akootan Pass, Bering Sea, Alaska.

Drawing by H. W. Elliott.

Kahlachta Point, entrance to
Oomalashka Harbor.

anywhere else. He saw fifteen Indians fishing there, and between one hundred and one hundred and fifty halibut of small size lying on the beach. The women were splitting them to dry.

In this region of Southeastern Alaska are two salmon-canning establishments—one at Klawack, and the other at Old Sitka or Turner's Point. In 1879 the Klawack cannery was said to have employed one hundred and sixty Indians and twenty whites. Of the Indians, thirty were women, five or six boys of eight to twelve years, and the rest men. In 1878 the wages for Indian men were one dollar, and for woman fifty cents per day. In 1879 the men received one dollar and twenty-five cents and the women seventy-five cents per day, although it is claimed there was no need of increasing the pay. The wages of the white men ranged from twenty dollars to fifty dollars per month. The season lasts about two months here. I suppose the capacity of the cannery is about the same as of the Old Sitka one, but there are no returns to refer to. The Old Sitka establishment is situated near the mouth of Sitka River; it was not in operation in 1880, but in 1879 it shipped seven thousand cases, of four dozen one-pound cans each, to the Cutting Packing Company of San Francisco. The boxes in which these cans are shipped are sent in shooks from Portland. The cans are made on the spot in a separate building. The high price for tin and solder was given as a reason for the inactivity of 1880. The salmon are seined by Indians, the seines being purchased by them from the cannery owners. The processes employed at Klawack and Turner's Point are essentially the same as in the Columbia River canneries. The Old Sitka establishment, either in 1878 or 1879, put up two hundred cases of halibut, each containing four dozen one-pound cans.

The eulachon, which we have from the Stickene River, Wrangell, Sitka, and Chilkat River, is caught in the same way and used for the same purposes, as described by Mr. Swan in his paper, in the Proceedings of the United States National Museum, vol. 3. The once famous Deep Lake salmon fishery at the Redoubt on Baranoff Island, which in 1868 secured two thousand barrels, is now reaping the results of overfishing. A description of the fishery by Mr. Dall is given in the Report of the Commissioner of Agriculture for 1870, page 385.

This account may be closed with the following list of the principal food-fishes of Southeastern Alaska:

- | | |
|--|-------------------------------------|
| 1. <i>Pleuronectes stellatus</i> . | 18. <i>Ophiodon elongatus</i> . |
| 2. <i>Lepidopsetta bilineata</i> . | 19. <i>Anoplopoma fimbria</i> . |
| 3. <i>Limanda aspera</i> . | 20. <i>Bathymaster signatus</i> . |
| 4. <i>Hippoglossoides elassodon</i> . | 21. <i>Ammodytes personatus</i> . |
| 5. <i>Hippoglossus vulgaris</i> . | 22. " <i>alascanus</i> . |
| 6. <i>Pollachius chalcogrammus</i> . | 23. <i>Mallotus villosus</i> . |
| 7. <i>Gadus morrhua</i> . | 24. <i>Hypomesus pretiosus</i> . |
| 8. <i>Microgadus proximus</i> . | 25. <i>Thaleichthys pacificus</i> . |
| 9. <i>Hemilepidotus trachurus</i> . | 26. <i>Salvelinus malma</i> . |
| 10. <i>Hemilepidotus Jordanii</i> . | 27. <i>Salmo purpuratus</i> . |
| 11. <i>Sebastichthys maliger</i> . | 28. " <i>Gairdnerii</i> . |
| 12. " <i>caurinus</i> . | 29. " <i>irideus</i> (probably). |
| 13. " <i>ruber</i> . | 30. <i>Oncorhynchus chouicha</i> . |
| 14. " <i>melanops</i> . ("Black bass," Sitka.) | 31. " <i>keta</i> . |
| 15. <i>Hexagrammus asper</i> . | 32. " <i>nerka</i> . |
| 16. " <i>superciliosus</i> . | 33. " <i>kisutch</i> . |
| 17. " <i>decagrammus</i> . | 34. " <i>gorbuscha</i> . |
| | 35. <i>Clupea mirabilis</i> . |

PRINCE WILLIAM SOUND DIVISION.

According to Mr. Petroff's estimate, there are five hundred Indians in this division, and among them, if we continue our usual proportion, there are about one hundred adult male fishermen. We have no information about the fishes or the methods of fishing, but it is safe to say that the region closely resembles the preceding one just described. They certainly have flat-fishes, flounders, halibut, cod, tom-cod, sculpins, launce, herring, and all the species of salmon, and doubtless many more; hair seal, too, are sure to be found just as they are in the inlet.

KENAI OR COOK'S INLET DISTRICT.

The number of adult male fishermen in this division is near two hundred in a total population of nine hundred and eighty-four. The most important fishes, as will be seen from the accompanying list, are halibut, cod, scaled sculpins, launce, capelin, eulachon, trout, salmon, and herring. The native methods of capture are essentially like those of Southeastern Alaska. This region is the field of two salmon fisheries operated by Capt. James Wilson, for the Alaska Commercial Company, and by Capt. H. R. Bowen, for the Western Fur and Trading Company. Mr. William J. Fisher, United States Coast Survey tidal observer at Saint Paul, Kodiak, has kindly obtained from these gentlemen most of the information we possess about those fisheries. Writing of the "king salmon," Mr. Fisher says:

"The Indians living near these two rivers catch only very small numbers of the fish, partly owing to their very imperfect implements used for the purpose. The fish being too large they cannot use their spears effectually. Their usual and most efficient mode of capture is as follows: A stage is erected in the river which an Indian mounts, holding a large wicker basket with an aperture of about five feet square, in the river, patiently waiting, sometimes for weary hours, before a salmon is so foolish as to enter the basket, while many hundred will go past, over, or under the basket, ignoring the invitation to enter. The natives smoke and dry their catch, and when they do sell any they charge at the rate of ten cents per fish."

Mr. Fisher gives the following notes on the "chowichee" or "king salmon" (*O. chowicha*):

"They are found in the inlet from May 20 to August 20, being more abundant during small tides; they are only one-fifth as plentiful as the silver salmon (*O. kisutch*), and one-third as abundant as red salmon (*O. nerka*); they reach a maximum length of six feet and a weight of forty pounds; they appear regularly on the 20th of May, running in pairs and not in schools, following the shore closely to avoid the beluga; they refuse to take the hook at all times; they prey upon eulachon and sticklebacks, not consuming very much; they are caught by the whites in weirs and nets; the nets are (of) eight and one-half inch mesh, twelve feet deep, and one hundred and twenty feet long, and are used during the entire season; the average daily catch is about one hundred fish; they are caught more plentifully from (the) first (of the ebb) to half-ebb tide; the natives dry them for winter use, while the whites salt them for shipment to San Francisco; small quantities are smoked; about three hundred barrels were salted in the season of 1880; one vessel, employing from five to eight men, is engaged in the fishery."

"The run of salmon in 1880 at Kenai was very light until July 20. Prior to that date the fish were running largely at Tyonik, about seventy miles up Cook's Inlet from Kenai, and also up the Sutchitna (Sushetno) River at the head of the inlet. These fish have seldom been known to go up the latter river during past years, and then only in very small numbers. The Sutchitna (Sushetno) River Indians, who, owing to scarcity of fish heretofore in their river, always bought their winter supply of smoked and dried fish from the natives of Tyonik, caught such an abundant supply in 1880 as to enable them to sell to their former purveyors."

On the 4th of July, 1880, we saw two species of salmon—"redfish" or "*krasnoi riba*" (*O. nerka*) and "*hoikoh*" (*O. keta*)—hanging on the drying-frames at Alexandrovsk in great numbers. A lagoon near the village, which receives a small but rapid stream, is well supplied with fish. In addition to the ordinary frame of poles on which the split and gashed salmon are hung, the natives frequently fasten small trees in the ground, cut off the limbs to a suitable length, and cover them with the blood-red fruits of their labors, making them a kind of Christmas tree of substantial. The little houses in which dried fish are stored for winter are set on logs placed endwise to insure protection from dogs. Cod and halibut are reported to be present here the year round. The halibut-line of these people is made of the stem of bull kelp, which grows here to an immense size. One of the plants measured aboard the "*Yukon*" had a stem sixty-seven and one-half feet long, with eighty-six fronds, two of which measured twenty-five and thirty-five feet, respectively. On this kelp line two hooks are fastened at the ends of a short bar on short snoods. The stone sinker is fastened to the middle of the bar by a snood longer than those holding the hooks. The bidarkas are made of the skins of hair seal. At the time of our visit seven skins of sea-otter recently killed were stretched on drying frames. The sea-otter are said to feed largely on chitons and clams. The abundance of fine clams near Alexandrovsk makes it a good otter-ground. From Alexandrovsk due northward is a settlement called Seldovia, consisting of sixty-eight Kodiak natives and creoles, who are devoted to sea-otter hunting. On the opposite side of Chugachik Gulf, near Anchor Point, is the village of Laida, containing seventy-eight Kenai people, who are also sea-otter hunters with indifferent success. Mr. Petroff gives a graphic account of the Kenai people, from which I extract the following remarks relating to the fishing:

"These people build birch-bark canoes with which to navigate the numerous swift and brawling rivers in their Territory, and they go down to the seaboard, buy skin canoes of the Kodiak pattern, and navigate to some extent on salt water, in quest of fish, in this manner. In this connection we wish to call attention to the fact that these people do not make, in any form whatever, wooden canoes; for that matter the explorer will find no wooden canoes north of Mount Saint Elias in this whole region. They are expert fishermen, and they certainly enjoy an abundance of piscatorial food, salmon of fine size and quality running up their rivers, trout in the thousand and one lakes of their country, finding them there all through the winter, fishing through the ice; and with a certain degree of contempt for the salt water, which is the treasure-trove and life-trust of the Kodiaker and the Aleutian, they spend no time there unless the steamboat-puffing of an approaching school of white whales attracts their cupidity and supplies them with a rare feast. These animals (the '*beluga*') are found here running up some of their rivers quite a distance."¹

THE KASSILOV SALMON FISHERY.

The Kassilov fishery, owned by the Western Fur and Trading Company of San Francisco, and operated by Capt. H. R. Bowen, is located at the mouth of Kassilov River, Cook's Inlet. It was established in 1879. The gill-nets are twenty-four fathoms long, two fathoms deep, with a mesh of eight and one half inches, and cost ten dollars each. They are made of Barber's shoe-thread. Gill-nets are used for salmon also. Two buildings, valued at two hundred and fifty dollars, are in use. There are three sixteen-foot dories. Four natives of Alaska are employed. The fishery is active from May 20 to September 1. Tide water makes up the river about seven miles; there are no obstructions except rapids. Two weirs are constructed here; the leaders are

¹ Preliminary Report on Census of Alaska, 1881, p. 36.

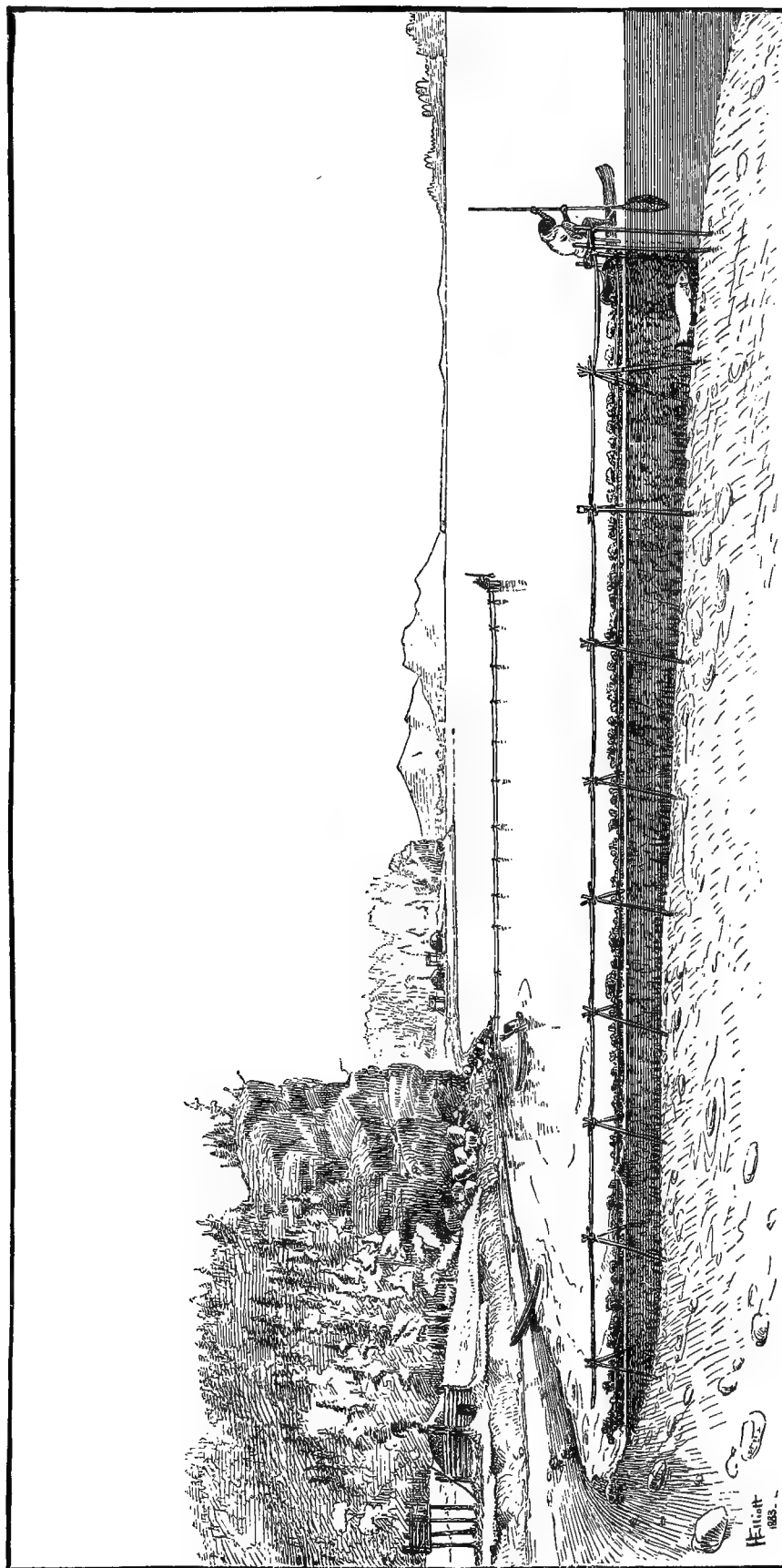
seventy-five feet long; the weirs or hearts are fifteen feet square, and are made of stakes and brush; they are kept down four months, beginning in June; "king" (*O. chowicha*), "silver" (*O. kisutch*), and "red salmon" (*O. nerka*) are taken in them. Captain Bowen says he is putting up the "king salmon" in full barrels with Liverpool salt. The first lot sent down brought ten dollars per barrel; the second lot, seven dollars. The flesh is very red when they first come; after they have been some time in the river the skin becomes red and the flesh light-colored. The "redfish" or "red salmon" sell for seven dollars in two half barrels or six dollars in full barrels. The "silver salmon" accompanies the red, is larger and every way superior, but is not nearly so plentiful. Captain Bowen put up fifty barrels of them last fall (1879) and says he could easily salt eight hundred barrels. These fish are sent to San Francisco by two schooners in August and October. Captain Bowen salts salmon bellies, also, in small packages. Bellies are worth twelve dollars by the barrel. Barrels, half-barrels, quarters, and kits are sent in shooks from San Francisco. They are made of Portland spruce. The half-barrel complete costs one dollar and seven cents, the barrel one dollar and thirty-nine cents for the stock alone. Barrel hoops cost twenty-four dollars per thousand.

Products of the Kassilov Salmon fishery, 1880.

Months.	Kind of salmon.	Barrels.	Number of fish.	Weight in pounds.
July.....	Chowichee bellies.....	160	8,000	320,000
August.....	Silver salmon	185	18,500	185,000

KENAI SALMON FISHERY.

The Alaska Commercial Company has established on Kenai River a fishery, which is managed by Capt. James Wilson, one of the company's traders. For the information concerning this fishery I am indebted to Mr. B. G. McIntyre, an agent of the Alaska Commercial Company. Salmon were first salted by this company in 1878, and bellies were first salted by them in 1879. The "Saint George," a trading schooner of one hundred and twenty tons, takes the barrels of salmon only incidentally, her regular business being that of a trader. Salmon in Cook's Inlet are very uncertain—some years the natives cannot get enough for their own use, and other years they are very abundant; this does not seem to depend on the severity of the winters. "King salmon" are taken in gill-nets, dip-nets, and weirs. Two weirs, similar to those in use at Kassilov, are in operation here. "Red salmon" are taken successfully only in seines. The natives here receive ten cents apiece for salmon. Only the bellies are salted; they are generally worth twelve dollars per barrel, sometimes fourteen dollars. At Kenai sixty pounds of salt are used to a barrel of fish. The fish are washed in pure spring water after they have been dressed, and then they are "struck" in the barrels in brine made of the same water. When the barrels are filled up after heading the brine added is made of spring water, but it must be brought to the boiling point and then put in after cooling. The brine does not seem to get strong enough unless it is boiled. The usual plan is to strike the fish and then repack, which takes eighty to one hundred pounds of salt. To put up a barrel of salt "king salmon" costs about three dollars and fifty cents at Kenai; one dollar for the fish, one dollar and seventy-five cents for the barrel and cooperage, forty cents for the salt, and thirty-five cents for the labor. The "red salmon" will not cost much less. Captain Wilson told Mr. McIntyre that in eleven years he has not seen a "king salmon" that weighed over one hundred pounds. The Alaska Commercial Company sells its salmon wherever a market offers. The amount salted in 1880



Stake and rider salmon weir. Constructed in the tide flats of Cook's Inlet by old Indians, and used exclusively by them. The young and able-bodied savages use gill-nets and traps.

Drawing by H. W. Elliott.

was one hundred and fifty barrels of bellies. Estimating fifty fish to the barrel we shall have seventy-five hundred fish, weighing about three hundred thousand pounds; of course, only a small portion of each fish goes to form the finished product.

For the sake of completeness I mention some of the principal food-fishes of Cook's Inlet:

<i>Pleuronectes stellatus</i> , Pallas.	<i>Mallotus villosus</i> , (Muller) Cuv.
<i>Lepidopsetta bilineata</i> , (Ayres) Gill.	<i>Thaleichthys pacificus</i> , (Rich.) Girard.
<i>Hippoglossus vulgaris</i> , Fleming.	<i>Salvelinus malma</i> , (Walb.) Jor. & Gilb.
<i>Pollachius chalcogrammus</i> , (Walb.) Jor. & Gilb.	<i>Salmo purpuratus</i> , Pallas.
<i>Gadus morrhua</i> , Linnaeus.	<i>Oncorhynchus chouicha</i> , (Walb.) Jor. & Gilb.
<i>Tilesia gracilis</i> , (Tiles.) Swainson.	" <i>keta</i> , (Walb.) Gill & Jor.
<i>Hemilepidotus trachurus</i> , (Pallas) Günther.	" <i>nerka</i> , (Walb.) Gill & Jor.
" <i>Jordanii</i> , Bean.	" <i>kisutch</i> , (Walb.) Jor. & Gilb.
<i>Hexagrammus asper</i> , Steller.	" <i>gorbuscha</i> , (Walb.) Gill & Jor.
<i>Ammodytes personatus</i> , Girard.	<i>Clupea mirabilis</i> , Girard.

KODIAK PARISH.

The total population of this division is stated to be about twenty-six hundred. Taking our usual percentage of this we shall have two hundred and twenty fishermen, most of whom are Kodiak Innuits and Creoles. The methods and results of the fishing, particularly on the island of Kodiak, have been greatly modified by civilization. The people have a wonderful wealth of fish in the waters around them, and they have learned how to capture and preserve them to the best advantage. Boats and small vessels of ten to thirty tons replace to a great extent the *bidarka*. While we were at Saint Paul a small vessel was being built for Captain Caton. The settlement on Wood Island has a small shipyard, where vessels of twenty-five or thirty tons are built for fishing and trade, according to Petroff.¹ The village of Afognak engages also in boat-building, at which the men are expert; they have many orders, chiefly for row-boats for the fishermen. Every settlement in this parish is engaged in sea-otter hunting, many of them almost exclusively. From Mitrofanía at the southern extreme to Douglas in the north, in the waters bathing the eastern shore of the peninsula of Alaska and the islands of the Kodiak group natives pursue this valuable quarry, securing, according to Mr. Petroff's returns, nine hundred skins in 1879. This number includes the catch to the eastward to Mount Saint Elias, but falls to the share of Kodiak Parish mainly. The small settlement of Ayakhtalik, on Goose Island, gets quite a number of sea-lion skins around Sitkhiak Island. The people of Kaguiak obtain a few sea lion skins, and the Orlovsk men secure a great many annually.

This parish is profusely supplied with cod, halibut, salmon, herring, capelin, eulachon, clams, and mussels. There are many other fishes which are abundant, but those named are the great staples. On the islands of Kodiak and Afognak alone Mr. Fisher records the following quantities prepared for home consumption:

	Salted salmon.	Salmon spawn.	Ukali.
	<i>Barrels.</i>	<i>Barrels.</i>	<i>Pounds.</i>
One hundred and sixty-five families of Creoles put up.....	990	82	126, 750
Three hundred and thirty-four families of Aleuts put up.....	.....	167	250, 500
Total	990	249	377, 250

¹ Preliminary Report on Census of Alaska, 1881, p. 29.

It must be kept in mind that one pound of *ukali* represents ten pounds of fresh fish. Mr. Fisher's estimates of the supplies of the settlements on Cook's Inlet and part of Aliaska Peninsula is as follows :

	Salted salmon.	Salmonspawn.	Ukali.
	<i>Barrels.</i>	<i>Barrels.</i>	<i>Pounds.</i>
Thirty-four Creole families put up.....	170	17	25,500
Three hundred and ten Indian families put up.....		155	230,000
Total.....	170	172	255,500

The average retail price of fresh fish at Saint Paul is one-half cent per pound, while the average price of fresh beef is ten cents per pound, and of salt pork fifteen cents. Cooked oysters are brought up from San Francisco and sell at forty cents per can. Canned lobsters from the same city are retailed at the same price. Clams from the vicinity sell for twenty cents a pail, fresh. Small quantities of salmon are smoked by the natives. Mr. Fisher names the following shell-fish as of common occurrence: *Cardium corbis*, *Cardium LaPerousii*, *Modiola*, *Tapes staminea*, *Saxidomus Nuttallii*.

THE KARLUK RIVER SALMON FISHERIES.

Karluk River, on the west side of Kodiak Island, furnishes more salt salmon than any other Alaskan stream, about sixteen hundred barrels having been secured there during the season of 1880 by two firms. One of these fisheries is owned by the Western Fur and Trading Company of San Francisco, and is operated by Capt. H. R. Bowen, of Saint Paul, Kodiak. Mr. Fisher has obtained from Captain Bowen the following account of that fishery: It was established in 1880, at the mouth of the river, and was active during June, July, August, September, and part of October. Fish run up the river into a lake—the source of the river—about seventeen miles. Tide-water extends up the stream about four miles. The only obstructions are rapids. All the species of *Oncorhynchus* now recognized run into the river; they are known by the Russian names “krasnoi riba,” “keezitch,” “chowichee,” “gorbuscha,” and “hoikoh.” The trout or “sumgah” (*Salvelinus malma*) also occurs here abundantly.

Salmon are caught at this fishery by seines, in the handling of which dories are used. The natives use their spears as well as seines; instead of dories they use bidarkas. There are about three hundred natives at the Karluk settlement, nearly all of whom are Kodiak Innuits. It is stated by Captain Bowen that these three hundred caught and dried at least one hundred thousand salmon (averaging one-half pound each in the dried state) during the summer.

The seines here are twenty-five fathoms long, three fathoms deep, with a mesh of three and one-fourth inches; they cost thirty-dollars each. Four dories, sixteen feet long, are in use. The fishery employs twenty men, five of whom are Norwegians and fifteen natives of Alaska. The product of the fishery is as follows:

	Number of fish.	Estimated weight, pounds.	Barrels.
<i>O. nerka.</i>			
June 16.....	750	7,500	15
June 17.....	3,000	30,000	60
June 18.....	2,000	20,000	40
June 19.....	3,000	30,000	60
June 20.....	3,000	30,000	60
June 21.....	1,500	15,000	30
Month of July.....	12,000	120,000	240
Month of August.....	7,500	75,000	150
<i>O. keta</i> and <i>gorbuscha</i> . ¹			
August 12.....	18,500	185,000	.....
September 18.....	21,000	210,000	.....

¹ Made into *ukali*.

The *ukali* were made for the use of native hunting parties. As before stated, the average weight of a cured fish is one-half pound; hence the fish converted to this use resulted in nineteen thousand seven hundred and fifty pounds of *ukali*.

The schooner "O. S. Fowler" of thirty-five and forty-five one-hundredths tons, is engaged in this fishery and the Kassilov fishery for the Western Fur and Trading Company. Captain Bowen informed me that her present value is five thousand dollars, and that her outlay for the season of 1880 was five thousand dollars, which includes the cost of the buildings at Saint Paul, Kodiak, used in preparing the fish for market. The "O. S. Fowler" has three Norwegians, one Russian Creole, and one American (the captain) as its force. She brought to Saint Paul one thousand barrels of salted salmon and nineteen thousand seven hundred and fifty pounds of *ukali* from Karluk and Kassilov, during the season of 1880.

Smith & Hirsch own a fishery which is also at the mouth of Karluk River. Charles Hirsch is the superintendent. According to Mr. B. G. McIntyre, this fishery was established in 1879, during which year they put up six hundred barrels of salt salmon which brought about six dollars per barrel. This firm has in its service the twenty-nine ton schooner "Calistoga", of which Oliver Smith is master. Her present value is said to be twenty-five hundred dollars. Besides the master she carries four men, one of whom is a Swede and the other three are Russian Creoles. The average share of the crew is twenty to thirty dollars per month. Mr. McIntyre, to whom I am indebted for information about the vessel, thinks the "Calistoga" had about five thousand dollars invested in the business in 1880. Smith & Hirsch are represented as having salted nine hundred and thirty-nine barrels of salmon and dried seventeen thousand five hundred pounds of *ukali*.

Two seines are used by Smith & Hirsch, and their dimensions are: Length, fifteen and twenty-five fathoms; depth, one and one-half and two fathoms; mesh, three and one-half and four and one-half inches. The smaller one cost twenty-five dollars and the larger thirty-five dollars. A building used here for fish-salting purposes cost five hundred dollars. Six eighteen-foot dories are in use. Twenty-five men are employed—one Swede, one Irishman, and twenty-three natives.

The results of the season of 1880 were as follows:

	Number of fish.	Estimated weight in pounds.	Barrels.
<i>O. nerka.</i>			
June.....	37,500	375,000	125
August.....	19,950	199,500	399
September.....	20,750	207,500	415

The average weight of these red salmon is estimated at ten pounds. Of the thirty-seven thousand five hundred fish caught in June only the bellies were salted, making one hundred and twenty-five barrels.

In the beginning of July red salmon became scarce, and after the run of humpbacks (*O. gorbuscha*) set in (July 12), the red salmon (*O. nerka*) disappeared altogether. Smith & Hirsch stopped fishing until August 14, when the red salmon again made their appearance.

During July, August, and September, Smith & Hirsch made into *ukali* thirty-five thousand red and humpback salmon, whose estimated weight fresh was three hundred thousand pounds; the *ukali* made from them weighed about seventeen thousand five hundred pounds.

The fish put up by this firm are consigned to the Alaska Commercial Company, and sold by Lynde & Hough, of San Francisco.

Captain Bowen says that a seine adapted for use at Karluk River should be thirty fathoms long, three fathoms deep, of three-inch mesh, with five-foot poles on the wings. He has caught and

cured at Karluk one hundred and seventy-five barrels of red salmon in less than four days with ten natives at work. The natives do everything but salt the fish; this Captain Bowen does himself. Ten men could average fifty barrels a day easily if a vessel could lie there every day, but Karluk is open to the sea. With proper buildings ashore ten thousand barrels might be put up in a season. At Karluk the salmon are thicker on the flood tide, becoming thicker as the tide rises, but going off at high water. Looking down into the water, it would seem that a lead-pencil could not be passed down between the densely crowded fish; a bidarka cannot be paddled over them when the salmon are thick.

Red salmon are abundant every year at Karluk. There is perhaps no better place in Alaska for the establishment of a great salmon fishery.

The following are the principal food and bait fishes of Kodiak Parish:

<i>Pleuronectes stellatus</i> , Pallas.	<i>Hexagrammus ordinatus</i> , Cope.
“ <i>quadrituberculatus</i> , Pallas.	“ <i>superciliosus</i> , (Pall.) Jor. & Gilb.
<i>Lepidopsetta bilineata</i> , (Ayres) Gilb.	“ <i>decagrammus</i> , (Pall.) Jor. & Gilb.
<i>Limanda aspera</i> , (Pall.) Bean.	<i>Pleurogrammus monopterygius</i> , (Pall.) Gill.
<i>Hippoglossoides elassodon</i> , Jor. & Gilb.	<i>Ammodytes personatus</i> , Girard.
<i>Hippoglossus vulgaris</i> , Flem.	<i>Mallotus villosus</i> , (Müller) Cuv.
<i>Atheresthes stomias</i> , Jor. & Gilb.	<i>Thaleichthys pacificus</i> , (Rich.) Girard.
<i>Pollachius chalcogrammus</i> , (Pall.) Jor. & Gilb.	<i>Salvelinus malma</i> , (Walb.) Jor. & Gilb.
<i>Gadus morrhua</i> , Linn.	<i>Salmo purpuratus</i> , Pallas.
<i>Tilesia gracilis</i> , (Tiles.) Swainson.	“ <i>Gairdnerii</i> , Rich.
<i>Cottus polyacanthocephalus</i> , Pallas.	<i>Oncorhynchus chouicha</i> , (Walb.) Jor. & Gilb.
<i>Hemilepidotus trachurus</i> , (Pall.) Günther.	“ <i>keta</i> , (Walb.) Gill & Jor.
“ <i>Jordanii</i> , Bean.	“ <i>nerka</i> , (Walb.) Gill & Jor.
<i>Sebastichthys melanops</i> , (Grd.) Jor. & Gilb.	“ <i>kisutch</i> , (Walb.) Jor. & Gilb.
“ <i>ciliatus</i> , (Tiles.)	“ <i>gorbuscha</i> , (Walb.) Gill & Jor.
<i>Hexagrammus asper</i> , Steller.	<i>Clupea mirabilis</i> , Girard.

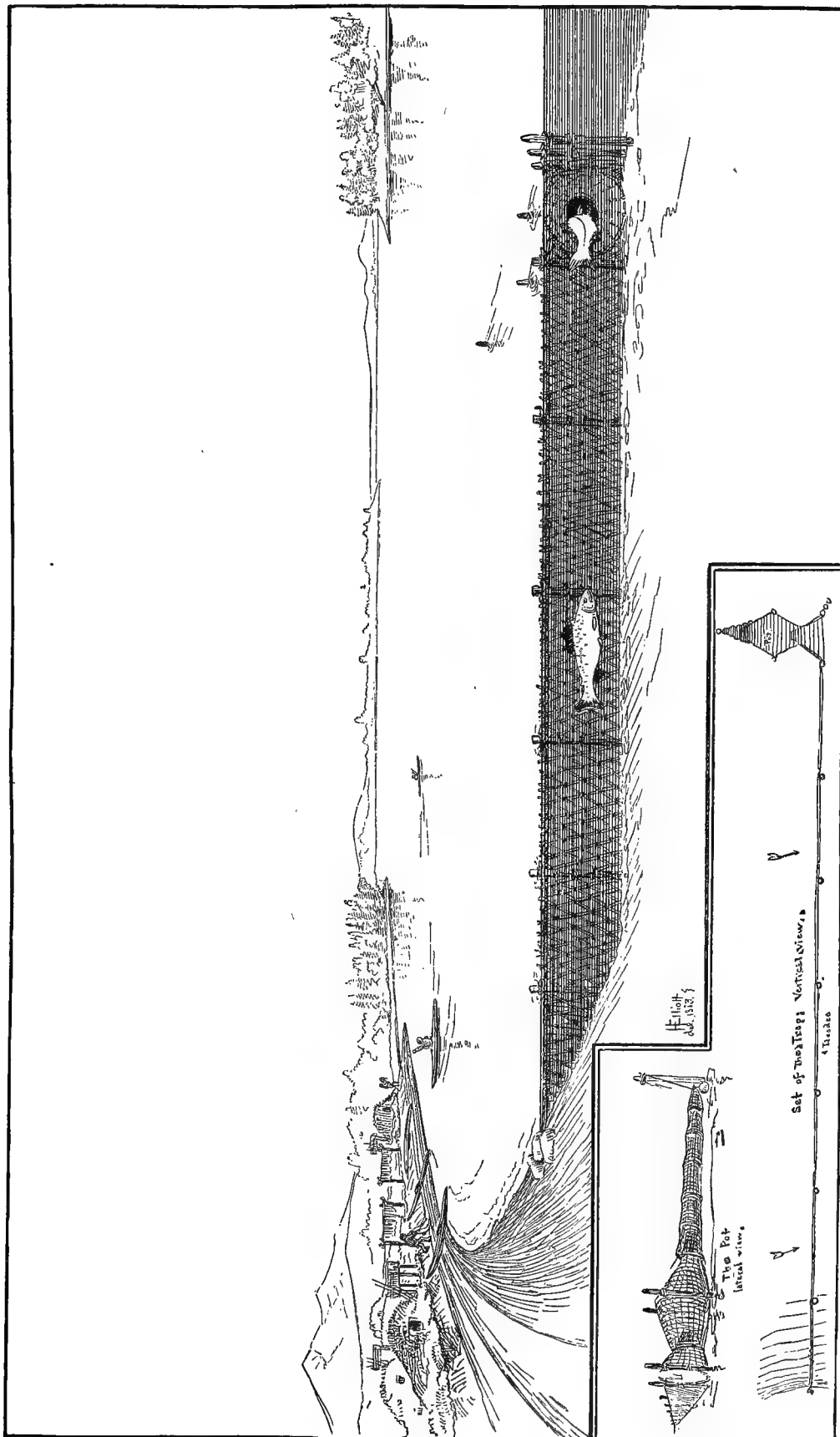
The following are the names of fishes given to us on the voyage from Alexandrovsk to Saint Paul, Kodiak, by a native of the island of Kodiak. The species were all shown to him except the *krasnoi riba*:

<i>Gadus morrhua</i>	Ah-mo-doc.
<i>Tilesia gracilis</i>	Sah-ke-lakh.
<i>Muraenoides ornatus</i>	Poo-lakh.
<i>Ammodytes personatus</i>	Ah-zhing ah-ryeerk.
<i>Hemilepidotus</i>	Kah-log.
<i>Cottus polyacanthocephalus</i>	Ki-oo-loong-chook.
<i>Gasterosteus cataphraetus</i>	E-lach-en-akh.
<i>Mallotus villosus</i>	She-gakh.
<i>Salvelinus malma</i>	Ahn-chuck.
<i>Oncorhynchus gorbuscha</i> ...	Ah-mah-kee-akh.
“ <i>keta</i>	Ah-lay-makh.
“ <i>nerka</i>	Nee-kee-uk.

Names of other objects:

<i>Littorina</i>	E-book.
<i>Diomedea brachyura</i>	Kay-may-ryeerk.

EXPLANATION.—A is sounded as in father, except in the second syllable of Ah-lay-makh, and in the first two syllables of Kay-may-ryeerk. The names express as nearly as possible the sounds used by the native in conveying his identification of the objects to me.



Salmon trap in common use by the natives on the great rivers of Alaska, especially on the Yukon and Kuskokvim.

Drawing by H. W. Elliott.

Settlements on Kodiak and Afognak Islands.

	Creoles.				Aleuts. ¹			
	Adults.		Children.		Adults.		Children.	
	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.
Saint Paul.....	77	82	55	53	5	6	1	3
Lesnoi.....	19	20	6	12	42	32	12	13
Afognak.....	68	66	36	25	40	44	36	24
Illobia.....	26	31	14	7				
Orlova (Eagle Harbor).....	6	6	4	1	84	83	39	55
Old Harbor.....	8	7	5	3	81	65	28	22
Kaguyak.....					97	60	35	41
Iachiok.....					36	32	30	16
Karluk.....	8	7	4	5	90	99	49	39
Total.....	212	219	124	106	475	421	230	213

¹ Actual count taken from church registers.

NOTE.—The totals of Creoles are equal to one hundred and sixty-five families of four persons each; the totals of Aleuts, to three hundred and thirty-four families of four persons each.

SALMON PREPARED BY NATIVES FOR HOME USE.

	Salmon salted.	Salmon spawn.	Ukali.
	<i>Barrels.</i>	<i>Barrels.</i>	<i>Pounds.</i>
One hundred and sixty-five families of Creoles put up.....	990	82	126,750
Three hundred and thirty-four families of Aleuts put up.....		167	250,500
Total.....	990	249	377,250

Settlements on Cook's Inlet and Alaska Peninsula.

[Actual count taken from the church registers.]

	Creoles.				Indians.			
	Adults.		Children.		Adults.		Children.	
	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.
Katmai.....	11	13	8	5	64	58	30	29
Kamishak.....					14	11	11	10
Nuchek.....					40	38	25	23
Illiamna.....					15	12	11	7
Alexandrovski.....					20	18	10	12
Seldowa.....					12	10	8	8
N. Nitchik.....	15	12	7	8				
					Families.			
Kassilov.....					<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> 4 30 30 30 30 10 10 10 20 </div> } Approximate. </div>			
Kenai.....	19	16	12	6				
Knik.....								
Tyonak.....								
Sutchitna.....								
N. Kishki.....								
Kusketan.....								
Kugak.....								
Douglas.....								
Total.....	34 families.				310 families.			

SALMON PREPARED BY NATIVES FOR HOME USE.

	Salmon salted.	Salmon spawn.	Ukali.
	<i>Barrels.</i>	<i>Barrels.</i>	<i>Pounds.</i>
Thirty-four families of Creoles put up for winter stores.	170	17	25,500
Three hundred and ten families of Indians.....		155	220,000
Total.....	170	172	255,500

Recapitulation of catch of fish for home consumption and export in 1880.

	Herring, smoked.	Codfish.		Salmon.			Ukali.
		Salted.	Boneless.	Smoked.	Salted.	Spawn.	
	<i>Boxes.¹</i>	<i>Barrels.</i>	<i>Barrels.</i>	<i>Pounds.</i>	<i>Barrels.</i>	<i>Barrels.</i>	<i>Pounds.</i>
Alaska Commercial Company.....					150		
Smith & Hirsch.....					939		17,500
Western Fur and Trading Company:							
Kassilov fishery.....					345		
Karluk fishery.....					655		19,750
Saint Paul fishery.....	500		250	4,000			
Creoles, Kodiak Island.....					990	82	126,750
Aleuts, Kodiak Island.....						167	250,500
Creoles, settlements, Alaska Peninsula.....					170	17	25,500
Indians, settlements, Alaska Peninsula.....						155	230,000
Total.....	500		250	4,000	3,249	421	670,000

¹ Boxes of thirty pounds each.

In addition to the above the Western Fur and Trading Company have put up experimentally:

Smoked halibut, pounds.....	500
Codfish tongues, in kits of twenty-five pounds each.....	10
Halibut fins and napes, salted, in kits of twenty-five pounds each.....	10
Frostfish, salted, in quarter barrels.....	10
Salmon-trout, salted, in quarter barrels.....	30
Codfish, dried, in one hundred pound boxes.....	30
Herring, salted, in quarter barrels.....	25
Herring, salted, in kits of twenty-five pounds each.....	100

BELKOFFSKY PARISH.

Since the fishes of this division are practically the same as those of the Shumagins, it is unnecessary to furnish a separate list of them. Mr. Petroff gives the population as six hundred and sixty-nine. The division, in fact, includes the settlements on the Shumagin group, and this group has essentially the same species as Kodiak Parish with the addition of *Trichodon stelleri* and *Bathymaster signatus*, the latter being important mainly for bait. *Bathymaster* is called "cusk" at Pirate Cove, Shumagins.

Belkoffsky Parish contains the settlements of Belkoffsky, Nikolaievsky, Protassov, Vosnessensky, Unga, and Korovinsky. The wealthiest of all is Belkoffsky, which has an abundance of fish, and takes nineteen hundred to two thousand sea-otter annually. Protassov takes five hundred sea-otter and some walrus. Unga takes about six hundred sea-otter. Vosnessensky and Korovinsky also take a few sea-otter. The natives of Korovinsky are occasionally employed at the cod-fishing stations of the Shumagins. At Belkoffsky, a fine salmon river falls into the bay. Natives take the salmon in small seines, and the women and children string them on twigs

and pieces of cord and drag them along just at the edge of the water around the beach to their village. The fish are piled in heaps and then begins the process of cutting, splitting, and gashing; preparatory to hanging them on the drying-frames. Great heaps of heads and entrails lie all around, very attractive to flies and beetles, but rather repulsive to visitors. At the time of our visit (July 23, 1880), *O. gorbuscha* was the species taken. Mr. Frost told me that the *gorbuscha* comes first, and that it appeared in quantities two weeks prior to our arrival; the "*hoikoh*" (*O. keta*) was there and the "*krasnoi riba*" (*O. nerka*), but neither of these was plentiful; they come later. Cod are caught in the harbor. A few cod were hanging up to dry, but salmon were abundant everywhere. The natives nearly all have comfortable-looking houses, a few of which are painted blue, with red roofs.

Mr. Devine says that natives from Korovinsky come over to a cove on Popoff Island, near Pirate Cove, to fish for salmon; they generally get good silver salmon (*O. kisutch*?) there. A silver salmon five feet long was brought to Pirate Cove in 1877; from the size, I would suppose this to have been *O. chowicha*. Clams are very abundant and excellent about the Shumagins.

One of the finest known baits for cod is common in deep water about the Shumagins; it is the "yellow-fish" or striped fish" (*Pleurogrammus monopterygius*), a species which is found in great schools and may be taken in the purse-seine like mackerel, which it resembles in size, and, after salting, in taste. Cod are passionately fond of this fish, and also of the "whiting" or "silver hake" of the region (*Pollachius chalcogrammus*). The Shumagin cod fishery, having already been treated at length, need not be entered upon here.

UNALASHKA PARISH.

This division, with a total population of nearly fourteen hundred, would have a fishing population of about two hundred and eighty. It includes the islands of Attu, Atka, Umnak, Unalashka, Spirkin, Akutan, Akun, and Avatanok. In this district will be observed a difference from the single paddle of the eastern shore of the Gulf of Alaska and the Kodiak group, the bidarkas here being propelled by double paddles and with quite a change of motion. The effect of the double paddle, which is grasped in the middle, is pretty, but the movement is not so steady as that resulting from the use of the single paddle. The bidarka is the universal form of boat for coasting and even for sea-going in weather that will allow its use.

Alut names of parts of a bidarka, obtained through Mr. King.

English.	Russian.	Alut.
Gunwale.....	Shistee.....	Un-mah-ghigh.
Keel.....	Keel.....	Ah-tah-kay.
Ribs.....	Riobra.....	Keel-ghagh.
Beams.....	Beamsi.....	Ah-gah-dach.
Stringer (between hatches).....	.....	Koo-lich.
Hatch.....	Luke.....	Oo-looch.
Stern.....	Korma.....	Tah-sach.
Lashings.....	Zaviaski.....	Eck-thoo-sahk.
Luvtak.....	Luvtak.....	Lach-tach-ach.
		Chang-iaak.
Nose of prow (in three pieces)...	Nosok.....	Kut-koo-mah.
		Koo-goo-show.

A good three-holed bidarka is worth from thirty dollars to fifty dollars. The luvtaks, or skin coverings of the wooden frame-work, are made of sea-lion here.

The fishes of this division are nearly the same as those of Kodiak Parish, with the exception of the species of *Sebastichthys*, none of which in the National Museum are from Unalashka Parish.

All the Alaskan species of *Hexagrammus*, however, are present, the commonest one at Iliuliuk, known to the whites as "green-fish" and to the Russians as *turpuk*, being *H. ordinatus* of Cope. These fish remind me very much of our cunner and tautog, but they are much better than either, being more solid and less bony. Flat-fishes and flounders are very abundant, and are taken in large quantities by the spear in the evening, when they come into the shoal water close to the shore, and may be readily seen on the sandy bottom. Halibut and cod abound. The "striped fish", "yellow-fish", or "Atka mackerel" exists here in immense numbers, and deserves to become a very important element in the Alaskan salt-fish trade. It extends around the whole of the Aleutian chain and the Shumagins, congregating in great schools. At Attu it is known as the "kelp-fish," at the Shumagins as the "yellow-fish" or "striped fish," and from Unalashka to Atka as the "Atka mackerel." The last name is derived from the fact that when salted just as mackerel are salted it has the same taste. I have been told that this fish can be taken by the purse-seine, its movements being similar to those of the common mackerel. There is no doubt that if the "striped fish" was properly introduced into the market it would find a ready sale, for it is certainly an excellent fish, either salted or fresh. The fish was originally described by Pallas as *Labrax monoptygius*, and is at present known as *Pleurogrammus monoptygius*, (Pallas) Gill. Last year it visited Chernoffsky and Iliuliuk, on Unalashka Island, reappearing at the latter place after an absence of a few years. Petroff states that "full barrels of it [have] commanded the unwonted price of twenty-four dollars each in San Francisco." Mr. Robert King, agent of the Western Fur and Trading Company for the Unalashka district, writes me as follows concerning the species: "Our agent at Atka says they are there in considerable numbers, and wishes me to make preparations for taking three hundred barrels, which he thinks may be obtained in one season of say two or three months. I believe these fish are more generally distributed than has been heretofore known, as we saw young ones of the same kind at Chernoffsky on this Island, and during the last few days there have been thousands of them moving through between the cribs of our wharf." Mr. King's letter was dated at Iliuliuk, August 3, 1880.

With regard to the price offered for the salted "striped fish," there seems to be some difference of experience. Mr. Hague, general agent of the Western Fur and Trading Company, has kindly written me the following concerning them: "The best offer we have had for these striped fish is for a quantity to arrive not to exceed forty to fifty barrels at ten dollars per barrel."

Trout and salmon are among the most important fishes of the region. The red-spotted trout and all the species of *Oncorhynchus* are taken in their season. Herring are not always abundant, but that they are of unusually good quality our own experience has proven.

Sea-lions are captured at Attu, and in rather large numbers, by the Akun people, who go to Oogamak for them and for the numerous hair-seals found there. The skins of the hair-seal and sea-lion are used in making bidarkas, which are used by the sea-otter hunters who visit Sanakh.

Quite a number of young fur-seals are caught by natives off Umnak, as they travel southward from Bering Sea. The people of Makushin, too, secure between one thousand and thirteen hundred of these animals yearly on their way through Umnak Straits in the fall. The inhabitants of Borka capture from twelve hundred to fourteen hundred young fur-seals in favorable seasons as they go through Oonalga Pass.

Sea-otter are taken in small numbers by the people of Akutan around the small islands near them and on the south end of Unimak. The village of Borka secures a few sea-otter in its vicinity, and some of its people also unite with the Unalashka hunters who visit Sanakh. The Chernoffsky natives take sea-otter in Umnak Straits and send representatives to Sanakh with the

Iliuliuk parties. Koshigin gets a few of these animals yearly in the same places as those visited by Chernoffsky natives. The people of Makushin and Iliuliuk join forces in quest of sea-otter at Sanakh, where they are taken, and whence they are brought back annually by vessels engaged in the trade. The people on the southwest coast of Umnak Island secure about one hundred and fifty sea-otter yearly. Atka is largely engaged also in this chase and successfully. Trading vessels carry its hunters to the haunts of the otter, where they remain during the season, and at the end of their work they are returned to their homes. Mr. Petroff, from whom I have copied my information about the otter, fur-seal, and sea-lion, gives the catch of sea-otter in Unalashka district, from the Shumagin Islands to Attu, as forty-eight hundred and fifty for the season of 1879.

In "Notes on the Islands of the Unalashka Region" (translation from the Russian title), by Ivan Veniaminoff, Vol. II, pages 402 to 408, will be found an account of the fishes which Mr. Marcus Baker, of the United States Coast and Geodetic Survey, has had the kindness to translate for me. What the bishop says about the methods of fishing is here quoted: "The method of taking the migratory fish by the Aleuts was formerly exceedingly crude and unprofitable. They built dams in the rivers, piling large stones on a kind of float where the circumstances admitted of it, which served as a barrier to the fish going up the rivers. Standing upon this they fished with small spears pointed with iron (and formerly with bone) and barbed, thrown into the water more by chance than by choice, and when by good luck a fish was struck it was dragged ashore by a line attached to the spear. They now (1840) make use of small nets; but at the principal settlements the company has large seines, with which more fish are taken at the time when they first begin to approach the shores or enter the bays."

At the present time short seines and the ordinary fishing gear of the United States are generally employed in the fisheries. *Ukali* forms a very important part of the trader's stock at Iliuliuk.

BRISTOL BAY DIVISION.

In this division there is a total population of forty-three hundred and forty. This may be called the great lake region of Alaska, the lakes emptying through rivers into Bristol Bay. Iliamna, the largest lake, is upwards of ninety miles long, and varies between fifteen and thirty miles in width. Nushegak, the largest river, wide and deep, with rapid current and turbid waters, rushes down from Nushegak Lake to the bay, and asserts its presence far out over bars and flats. Besides the Nushegak there are seven other rivers in the division.

At Nushegak, Mr. Petroff says, the Unalashka style of bidarka is left behind, and is replaced by the one-holed "kyak," a skin canoe similar to the bidarka and similarly propelled. The spear is much used in fishing and in the capture of seal. The lance is in great demand for sealing, too.

The coast population have opportunities to take walrus, seals, beluga, and an occasional stranded whale. The settlement of Igagik, according to Petroff, devotes its time principally to the walrus hunt. At Kulluk, again, is a small population, devoted largely to the chase of walrus and seal; here the banded seal (*Histiophoca fasciata*) is found along with others. It is claimed that a fresh-water seal inhabits Iliamna Lake, but the statement needs to be confirmed by the possession of a specimen.

The principal fish of the region are flat-fish, flounders, halibut, cod, pollock, "wachna," sculpins, two or more species of "green-fish" (*Hexagrammus*), launce, capelin, trout, whitefish, salmon, and herring. In order to form some idea of the abundance of salmon one should read Petroff's description of the Igushek River and of the Togiak as well.¹ The whole region is

¹ Preliminary Report on Census of Alaska, 1881, p. 48.

abundantly supplied with choice fish, while the sea-coast is inhabited by the larger marine animals already mentioned. I have been told that Iliamna Lake is well stocked with the best of fish.

The following are some of the food-fishes of Bristol Bay division:

Pleuronectes stellatus.	Ammodytes personatus.
Lepidopsetta bilineata.	Mallotus villosus.
Limanda aspera.	Salvelinus malma.
Hippoglossus vulgaris.	Salmo purpuratus.
Pollachius chalcogrammus.	Oncorhynchus chouicha.
Gadus morrhua.	“ keta.
Tilesia gracilis.	“ nerka.
Cottus polyacanthocephalus.	“ kisutch.
Gymnacanthus galeatus.	“ gorbusha.
Hexagrammus asper.	Clupea mirabilis.
“ ordinatus.	

Besides these there are some species of *Coregonus* which have not come into the United States National Museum and have not been recorded by any writer, so far as I know.

PRIBILOFF ISLANDS.

This group is so thoroughly absorbed in the important business of taking fur-seal that the trifling occupation of fishing is, for the most part, left to the small boys, and their principal catch is the skulking, rock-loving sculpin, known to the Aleuts as kah-log. They have smooth-skinned sculpins and scaled sculpins, representing the genera *Cottus* and *Melletes*, but all are kah-log. Large halibut, too large to be devoured by the roaring “lion” and the bellowing “bear,” which exterminate all the unwary small fry, are the only important fish that can be readily taken near the shores. The *bidarra* is the fishing-boat, and the fishing implements are all from the United States.

Sea-lion are taken in large numbers, and are very important for the covering of *bidarras*.

SAINT MATHEW AND SAINT LAWRENCE ISLANDS.

Saint Mathew is a great resort for walrus, and it was once supposed that fur-seal might be taken there in large numbers.

Saint Lawrence Island derives a precarious subsistence from the walrus and seal that visit its shores, and, according to Captain Hooper, are present all the year. Whales also supply a large part of the food of its people. The walrus and the seal furnish them not only with food, but also with houses, fuel, boats, and clothing. Their catch of whalebone and walrus ivory is disposed of to traders for rum, rifles, and ammunition. This island marks nearly the northern limit of the codfish, which is occasionally taken there.

KUSKOQUIM DIVISION.

We have here a population of thirty-six hundred and fifty-four, which is augmented during the salmon fishing to six or seven thousand, according to Mr. Petroff, from whose report I take the bulk of the information concerning the fishes of the Kuskokwim River. In the absence of collections, we know nothing definite about the species of fish, but it is reasonable to suppose that they do not differ greatly from those of the Yukon, from which we have many species, as will be seen from the list accompanying the account of that division. Salmon, trout, and whitefish are

the principal and prevailing forms, and the fact that the people of the region not only consume vast quantities themselves, but also divide their supplies with about two thousand natives from the lower delta of the Yukon, is a sufficient voucher for the wonderful abundance of fish.

The run of salmon up this stream is very great, and is long continued, the season opening in June and not closing until the end of August. The density of the population, as so remarkably portrayed in our list of the settlements at the mouth and in the immediate country adjoining, is such that in their active and energetic fishing for their own consumption they seem to absorb the greater part of this salmon run; at least the natives at the source of the river complain very often of the scarcity of salmon. Not only the people of the Kuskokwim proper fish here, but even those of the lower delta of the Great Yukon. Two thousand of them come over here to fish, making a sum total of six or seven thousand fish-eaters, consuming and wasting a quantity of salmon that should feed at least six or eight times their number were the fish canned or salted, instead of being used in their wasteful processes.¹

YUKON DIVISION.

I shall combine here the two sections of Mr. Petroff, put down as Yukon delta and Upoon mouth to Anvik, with a population of thirty-three hundred and fifty-one.

According to Petroff, hair-seals (two species) ascend the Yukon as far as three hundred to four hundred miles. White whales or beluga are abundant in the mouths of the river, where they pursue the salmon.

The number of species of marine fishes is comparatively small, while there are a goodly number of river fishes, particularly salmon and whitefish. There is generally no trouble in getting all the salmon required by the natives for bounteous subsistence, but Mr. Petroff mentions a contingency that arose last summer by which a fish famine was caused at the mouth of the Yukon. At the breaking up of the ice in the spring, it came down in such masses that it grounded in the delta in the month of July and prevented the ascent of the salmon. Natives had to seek food northward along the shore of Norton Sound and down on the Kuskokwim. To the people of the Lower Yukon the absence of fish means starvation, unless a supply can be obtained from other sources. The run of salmon in the Yukon is short, not much exceeding two months in all. Mr. Dall has published a memorandum of the trap-fishing at Nulato, on the Yukon, based upon his observations extending over several seasons, and this will give a good idea of the species taken and their relative abundance at different seasons.

NOVEMBER.—The fish-traps are set for winter. A week or two usually elapses before the trap takes any fish. The natives say that it is necessary for the resin to be washed out of the wood of which the basket and funnel are made before the fish will approach the trap. The first fish taken are the losh (*Lota maculosa*), which usually come in great numbers.

DECEMBER.—Suckers and losh predominate. A few whitefish and a straggling salmon are occasionally taken.

JANUARY.—Much the same; but the whitefish begin to be more plentiful.

FEBRUARY.—Losh scarce. The traps are filled with the different species of whitefish.

MARCH.—Much the same; but suckers begin to enter the traps.

APRIL.—Graylings and suckers very plenty; whitefish more scarce; a few losh taken.

MAY.—A few poor whitefish and small losh are taken, but the bulk of the catch is composed of graylings. Ice carries away the traps. As soon as the river is clear new traps and gill-nets are set.

¹ Petroff, Preliminary Report on Census of Alaska, 1881, p. 52.

JUNE.—King salmon appear toward the middle of the month.

JULY.—“*Hoikoh*” (*O. keta*), “redfish” (*O. nerka*), “dogfish” (*O. gorbuscha*), and a few whitefish.

AUGUST.—*Keezich* and straggling salmon of the other species. Whitefish, especially the *Luciotrutta* and *muksun*, are more abundant.

SEPTEMBER.—Salmon trout and whitefish are in their best condition and most abundant.

OCTOBER.—Much the same; but toward the twentieth of the month ice begins to form and puts a stop to fishing until it is firm enough to allow of the setting of the winter traps, which does not usually occur until early in the following month.¹

The method of making and setting the Yukon fish-traps is so well explained by Mr. Dall in the paper already quoted, that I shall simply state that the trap is essentially a double fyke-net with the fence placed at right angles with the bank of the river, catching fish either ascending or descending the stream. Gill nets and seines are used in summer. The Tinneh tribes formerly made their seines out of the inner bark of willow and alder. The Innuits made theirs of fine seal-skin strips. In localities where the river is small and narrow, the natives make what corresponds in effect with the V-shaped fish-trap of the Susquehanna and other Eastern rivers—huge bundles of willow brush are tied together and placed side by side so as to block the passage of fish completely, except at the little opening where the basket is placed. Birch canoes are used in river fishing on the Yukon.

We have little information about the running of the Yukon salmon beyond that obtained by Mr. Dall from the natives at Fort Derabin, Nulato, which follows:

“*King salmon*: Arrive at Nulato ‘when the trees have got into full leaf,’ about the 20th of June, and continue to run about three weeks. The last that come up are poor and lean. *Hoikoh*: The first arrive about the 10th of July, just as the king salmon are about gone, and they last about three weeks. Stragglers are occasionally caught as late as January. *Redfish*: This arrives about a week or ten days after the first hoikoh, and continues with the latter until about the end of August. A few straggling dogfish are occasionally caught with it, but the majority of this species do not ascend the river as high as Nulato. *Keezich*: This is the last of the salmon to ascend the river, and is obtained until the cold weather sets in and puts a stop to the summer fishing.”

The same habit of running in twos or threes instead of in schools is reported of the “king salmon” in the Yukon, as well as in the rivers of Cook’s Inlet. Capt. E. P. Herendeen told me that he has always noticed it, and he thinks the salmon follow the shore to escape the *beluga*.

The superiority of the king salmon of the Yukon has long been well known; persons who are able to secure a supply of the salted bellies from that source consider themselves very fortunate. The species seems to improve in flavor regularly to the northern limit of its distribution, although it is highly prized even on the Columbia.

The following is a list of the principal fishes of the Yukon division:

Flat-fish	<i>Pleuronectes stellatus</i> . (Marine.)
	“ <i>glacialis</i> . (Marine.)
	<i>Limanda aspera</i> . (Marine.)
Halibut.....	<i>Hippoglossus vulgaris</i> . (Marine.)
Polar cod.....	<i>Boreogadus saida</i> . (Marine.)
Wachna	<i>Tilesia gracilis</i> . (Marine.)

¹ Report of Commissioner of Agriculture for 1870 (1871), p. 392.

Burbot or losh	<i>Lota maculosa</i> . (Fresh water.)
	<i>Lycodes Turnerii</i> . (Marine.)
Sculpin	<i>Cottus polyacanthocephalus</i> . (Marine.)
	" <i>tæniopterus</i> . (Marine.)
	" <i>humilis</i> . (Marine.)
	<i>Hexagrammus asper</i> . (Marine.)
Launce	<i>Ammodytes americanus</i> . (Marine.)
Pike	<i>Esox lucius</i> . (Fresh water.)
Smelt	<i>Osmerus dentex</i> . (Marine.)
Capelin	<i>Mallotus villosus</i> . (Marine.)
Smelt	<i>Hypomesus olidus</i> . (Fresh water.)
Whitefish	<i>Coregonus Artedi</i> . (Fresh water.)
	" <i>Laurettæ</i> . (Fresh water.)
	" <i>Merkii</i> , subsp. (Fresh water.)
	" <i>clupeiformis</i> . (Fresh water.)
	" <i>Kennicottii</i> . (Fresh water.)
	" <i>quadrilateralis</i> . (Fresh water.)
Grayling	<i>Thymallus signifer</i> . (Fresh water.)
Trout	<i>Salvelinus malma</i> . (Fresh water.)
Salmon	<i>Oncorhynchus chouicha</i> . (Fresh water.)
	" <i>keta</i> . (Fresh water.)
	" <i>nerka</i> . (Fresh water.)
	" <i>kisutch</i> . (Fresh water.)
	" <i>gorbuscha</i> . (Fresh water.)
Herring	<i>Clupea mirabilis</i> . (Marine.)
Sucker	<i>Catostomus longirostris</i> . (Fresh water.)
Lamprey	<i>Ammocetes aureus</i> . (Fresh water.)

According to Mr. L. M. Turner, the lamprey is very abundant at Anvik and is used for food.

Although the Ingaliiks, or the people of the great interior, are omitted here, they have an abundance of salmon and whitefish in the Upper Yukon and the Tananah.

NORTON SOUND DIVISION.

In the region embracing the coast of the Sound from Saint Michael's upward and as far as Sledge Island, Mr. Petroff reports six hundred and thirty-three inhabitants. The fishes, of course, are about the same as those mentioned in the Yukon division and need not be repeated. There is one very important fishery, the tom-cod or *wachna* fishery, which is characteristic of the region, and should be described in detail. This has already been done by Mr. Dall in the following terms:

"This fish much resembles the common tom-cod of the Eastern States, . . . but, while the latter is of most insignificant importance from its scarcity and poor quality, the former species occupies a very important place in the domestic economy of both natives and Russians on both shores of Bering Sea. It is apparently a permanent inhabitant of these coasts, but is most abundant in the fall of the year, when the ice begins to form in the rivers and along the shores. The Waúkhni fishery commences about the middle of October. At first it is caught from boats anchored close inshore, but later the natives cut holes in the new ice, set up two or three stakes, with a mat hung upon them to keep off the wind, and sit there all day, hauling them in as fast as

the line is dropped into the water. The hook is made of white walrus ivory, furnished with a sharp pin set in obliquely, but without a barb. The whiteness of the ivory, which is kept constantly in motion, attracts the fish, but no bait whatever is used. In November, when the ice becomes very thick, and the cold increases, the fish retire to deeper water, and the fishing is over until the following spring. In the summer the natives are occupied with the salmon fishery and pay no attention to these small fish. They are preserved by removing the intestines, and drying in large bunches strung on seal-line, or by throwing them as they are into long cylindrical baskets made of twisted grass, and keeping them entire in a frozen state. . . . They are among the most palatable of the many fish found in these seas, and the number preserved is so great as to be almost incalculable. They serve the natives for food either boiled or in the frozen state. They also form an important article of dog-feed in the northern portions of Alaska, near the coast. They are well suited, from their abundance and firm flesh, to be used as bait in the cod-fishery."¹

The *wachna* extends southward into Cook's Inlet, where I have seen individuals a foot in length; their average length so far as observed by me is about ten inches and their weight a half pound or less. The form is much like that of the tom-cod, but by pressing on the sides of the body a little behind the breast fins a series of small knobs will be felt on the ends of the lateral processes of the backbone; these are caused by white, spoon-shaped, flexible caps that fit on the processes and help to form a sort of roof over the abdominal cavity; the presence of these appendages makes it necessary to use another name than *Gadus* for the genus, and as Swainson has proposed to call it *Tilesia*, though on trivial grounds, his name may be used. It is usual to see traveling parties of Innuits in summer supplied with strings of *wachna* with the intestines partly removed and a very gamy flavor substituted. The hook of walrus ivory is still used, and farther north it is attached to a line of whalebone splints.

The herring run in Norton Sound is of very short duration, the fishery lasting only a fortnight, but the schools are enormously large. Seines are used in taking them. The fish are kept until they become half putrid, and are then considered at their best.

Parties traveling in summer by sea in this region are usually well supplied with a small flat-fish (*Pleuronectes glacialis*), which has a close resemblance to the "fool-fish" or "Christmas fish" of Massachusetts Bay and the Maine coast, together with *wachnæ* and smelt.

The sea boat in common use is the *bidarra* or *baidar* (*oomiak* of the Inuit), a flat-bottomed, walrus-skin covering stretched over a wooden frame-work and securely lashed with whalebone and seal-skin strips or sinew. Occasionally an oar is used, the wooden rowlock being lashed to a rib with thongs, but short paddles are more general. A small square sail is always used when the wind is favorable, and when not forced to embark against wind and tide the native emulates his civilized brother, and waits. The *bidarra* serves not only as a mode of conveyance by day, but also as a shelter for the night. As this boat is so largely used throughout Northern Alaska it will be of interest to quote portions of Captain Hooper's remarks on the subject:

"An ordinary oomiak contains, in addition to the stock-in-trade of oil, skins, etc., a tent of drilling or deer-skin, guns, traps, spears, bows and arrows, a *kyack*, a seal-skin poke filled with water, a quantity of dried meat, a sled, several pairs of snow-shoes, a fish-net, and several smaller nets for catching birds, a large drum on a pole for the use of the 'shaman,' and several seal-skin bags containing skin clothing. The *personnel* consists of three or four men, about as many women, and two or three children. Add to these two or three dogs, each with a litter of puppies, and some idea may be formed of what a traveling oomiak contains. The working dogs are often

¹ Report of Commissioner of Agriculture for 1870 (1871), p. 380.

left on the beach to follow on foot, which they do, keeping up a continued and most dismal howl. If the wind comes in ahead, and the natives desire, for any reason, to continue their journey, they paddle in near the shore, harness their dogs, and attach them to the oomiak, after the manner of a canal-boat and horses, settle themselves in the boat, and saying 'nakouruck' (good!), go on their way at the rate of four or five miles an hour with no other effort than steering with the paddle."¹

Fish hooks and lines also form an important part of the oomiak outfit, since fish, especially in summer, are so largely depended upon for food.

Seal, walrus, and whale, as well as *beluga*, are important objects of the chase in this division, but as the methods pursued are the same as we find farther north we will refer to this subject again.

KING'S ISLAND TO POINT BARROW.

For this extent of territory Mr. Petroff gives a total population of twenty-nine hundred and ninety. For convenience of treatment I shall subdivide the region into several smaller parts, taking up Port Clarence, Kotzebue Sound, and Arctic Alaska north of Kotzebue Sound, separately.

1. PORT CLARENCE AND VICINITY.—We must include here King's Island, one of the most remarkable human habitations in any country, with a reputed population of one hundred souls on its inhospitable cliffs. The shores are all bold, and the contour is jagged and broken. Here, in summer-houses of walrus skins, and winter burrows in the face of the cliffs, live a class of seal and walrus hunters who are said to be the bravest sailors in Alaska. I have heard it stated that men are sometimes lifted up in their kyacks by their comrades and thrown from the cliffs clear of the surf, which must roll almost incessantly around those ragged rocks. Clad in a water-proof kamlayka, or shirt made of the intestines of walrus, the hardy islander is thrown out to battle with the waves that would surely engulf a less skillful sailor. Captain Hooper says that the kyack of these people is covered with walrus hide. The bidarras have the same kind of covering, and while at sea, transporting trading goods, etc., a cover protects the cargo from breaking waves. The flesh of seal and walrus forms the principal food of these natives, but in summer a part of them may be found at Port Clarence and on the east side of the bay of which this harbor forms a portion, engaged in trading and fishing.

The skins of walrus and hair-seal are converted by these men into "luvtak" which form boat-covers; these are carried off to the mainland for trade. The throat of the seal is made up by the King's Island natives into water-proof boots, which are in great demand for the use of whalers, and their seal-skin boots are largely disposed of to the same parties. The Cape Prince of Wales men are fishermen and whalers.

In the shallow, fresh-water lagoons, so plentiful on the spit protecting the western side of Port Clarence, there are great quantities of sticklebacks. The King's Island people, who were here at the time of our visit, brought to us whitefish (*Coregonus Laurettae*), smelt (*Osmerus dentex*), herring (*Clupea mirabilis*), and "wachna" (*Tilesia gracilis*). They were well provided with oil in seal-skin bags, fishing-lines, hooks, and sinkers. The sinkers were made of soft stone resembling slate, often of two colors, one light and the other dark, abruptly divided. A hole was drilled at each end and a shallow groove was made to receive the line. The holes were drilled by means of a piece of steel or iron rotated by an ivory or bone drill-bow supplied with a string of sinew. The commonest form of line was made of narrow strips of whalebone neatly fastened together. The hook is often an ivory or bone imitation of a fish, and sometimes two, sometimes four, are

¹ Report of Cruise of Corwin, November 1, 1880 (1881), p. 28.

fastened to one shank. Occasionally pieces of white and bluish stones are made the basis of support for the hooks, and great taste is shown in their arrangement. As an additional lure, we saw what was supposed to be the corneous appendage of the angle of the mouth of mormons, which, when dry, resembles in shape and color an imperfect salmon egg. The rod was not over two and one-half feet long, and the line of about ten or twelve feet was neatly folded around the ends of the rod, which were crotched to receive it. Over the jig-like hook was pulled a sheath of seal-skin as a protection against accidents.

From the settlement at Port Clarence we obtained some dressed skins of the red-spotted trout (*Salvelinus malma*), which are used for making quite ornamental water-proof vests. Small seines are used.

The following are some of the edible fishes of Port Clarence:

<i>Pleuronectes stellatus</i> .	<i>Mallotus villosus</i> .
“ <i>glacialis</i> .	<i>Hypomesus olidus</i> .
<i>Limanda aspera</i> .	<i>Coregonus Laurettæ</i> .
<i>Hippoglossus vulgaris</i> .	“ <i>Merkii</i> .
<i>Boreogadus saida</i> .	<i>Salvelinus malma</i> .
<i>Tilesia gracilis</i> .	<i>Oncorhynchus chouicha</i> .
<i>Cottus polyacanthocephalus</i> .	“ <i>keta</i> .
“ <i>tæniopterus</i> .	“ <i>nerka</i> .
“ <i>humilis</i> .	“ <i>kisutch</i> .
<i>Hexagrammus asper</i> .	“ <i>gorbuscha</i> .
<i>Ammodytes personatus</i> .	<i>Clupea mirabilis</i> .
<i>Osmerus dentex</i> .	

2. KOTZEBUE SOUND.—In this body of water, especially in Eschscholtz Bay, the *beluga* or white whale is extensively taken. In the vicinity of Elephant Point we found numerous skulls of this animal lying on the beach, not far from the mouth of Buckland River.

“There are no natives living on Eschscholtz Bay, but a number are located on the Buckland River, and come down to the bay during the summer months to kill white whales (*Beluga catodon*), catch salmon, and gather berries, which they ‘cache’ until the snow comes, when they are taken to the settlement on sledges. Like all Indians, these are very superstitious. While hunting the white whale they are not allowed to chop wood, dig in the earth, sew, tan skins, and many other things, for fear the spirit that controls the movements of the white whales will take offense and not permit them to return the next season. When the whaling is completed they collect the bones and burn them; those who can afford it burn the clothes worn while whaling, the poorer natives paying tribute to the ‘god of the white whale,’ by cutting off and burning a small piece of some garment.”

“The ‘kyack’ used by the natives on Kotzebue Sound, and, in fact, along the entire coast to Point Barrow, is a marvel of speed and beauty. It is very narrow and light, and great skill is required in its management. In these fleet boats the natives easily drive the white whale, a very timid animal, into shallow water, where it is dispatched with strong, flint-headed spears.”¹

The spear-point used here for the capture of *beluga* is usually made of a brown or black stone which is very hard; this is fastened to a wooden handle, about four feet in length, by strips of whalebone. The *beluga* are hunted in kyacks; a dozen or more natives take up a position near the entrance of some bay, where they can see them as they come in with the tide. As soon as they have passed, the natives paddle out behind them, and, by shouting and beating the water,

¹HOOPER, Report of Cruise of Corwin, 1881, pp. 24-25.

drive them into shoal water, where they are easily dispatched with flint spears. According to their tradition, to kill the *beluga* with any other weapon would entail endless misfortune upon the guilty party.¹ We might suppose that the *beluga* spear would be held in high esteem by the Inuit, but, on the contrary, it is freely bartered for a trifle of tobacco or a few percussion-caps.

In this portion of Alaska the capture of hair-seals is one of the most important native occupations. The seal is patiently watched for until it appears at its breathing-hole, when it is shot with a rifle. A very ingenious decoy used by these natives is a short piece of wood on which are fastened seal-claws, which are intended to make a scratching sound like that of the seal. Captain Hooper thus describes the movements of the seal hunter :

"The hunter approaches cautiously, by crawling over the ice, his body nearly prostrate, raised slightly on one elbow. He has a piece of bear-skin, about two feet long and a foot wide, which he attaches to his leg on the side upon which he rests; this enables him to slide more easily over the ice. The elbow rests upon a ring of grass."

As already mentioned, seal oil is carried in seal-skin pouches or bags, and the natives sometimes partly fill the bag with water and partly with oil when making preparations for trading.

The gill-nets used by the Arctic Alaskan natives for the capture of seal did not come under my observation, but those used in Plover Bay, which are similar to the Alaskan, are made of strong seal-skin line. They are about thirty to forty feet long and six deep; the bottom is furnished with stone sinkers at short intervals, and the top has a series of floats made of stuffed seal flippers; they are set off from the beach and sunk to the bottom, standing up for the seal to run into as they swim along shore in search of food. Seal-skin lines are attached to the net and held by heavy stones on the beach; with these the net is hauled in when a seal has been secured. A small stone placed on the slack of some of the hauling lines and readily displaced by the struggle of a captive shows when to take up the net. Captain Hooper says the Alaskan gill-net is set from the shore by means of a pole sixty to eighty feet long, made by joining a number of short poles together; with this the net is pushed out to its desired position and then the pole is withdrawn. The seal-skin lines are cut from a skin by passing round and round continuously. The line is then stretched between whalebone posts or large rocks, and the whole net after it is finished is folded into a narrow, long bundle, and carefully stretched between similar supports.

A glance at the map will show this region to be supplied with a few rivers, the Selawik and Finland being the largest. Selawik River communicates, through a lake of the same name, with Hotham Inlet, near the mouth of which the Finland empties also. Buckland River, a small but important salmon stream, flows into Eschscholtz Bay. These streams are well supplied with salmon and whitefish. Petroff says that "the streams or small rivers which empty into Kotzebue Sound mark the extreme northern limit of the run of salmon in America,"² but in this he was, perhaps, misled by Seemann. We took the young of the red-spotted trout at Cape Lisburne in the summer of 1880, and at least one species of *Oncorhynchus* is known from as far north as Colville River.

The species of fish observed by us in the possession of natives in Kotzebue Sound were fresh flat-fish (*Pleuronectes glacialis*) and smelt (*Osmerus dentex*) and a species of dried salmon. Dried smelt were obtained also. Most of the species recorded from the region were taken in our seine.

While in Eschscholtz Bay, natives from Cape Espenberg were there for the purpose of fishing and trading. They were well supplied with small objects made of walrus ivory, and many of

¹HOOPER: Op. cit., p. 59.

²Preliminary Report on Census of Alaska, 1881, p. 59.

these were curiously carved to represent seal, walrus, bear, whale, and even the singular large isopod crustacean so common on all the Arctic beaches. The articles were usually intended for belt-toggles, powder-charges, swivels, lance-heads, and other useful implements, but some were representations of the human figure or other merely ornamental subject. Quantities of seal-skin line were freely traded for a mere trifle. The lance-heads usually consisted of a base of ivory or bone and an iron point.

Seemann says that herring and whiting are very abundant in Hotham Inlet. The whiting of Seemann is supposed to be *Pollachius chalcogrammus*, but there is some doubt about the occurrence of this species so far north, since none of the collectors at Saint Michael's have sent it down from their still more southern latitude. The mullet of Seemann must be a large species of whitefish (*Coregonus*). The mode of fishing in these waters is thus described by Captain Hooper:

"Salmon and other small fish are taken in nets, either by a seine in the ordinary way, or by means of a gill-net, which is set from the shore in a very ingenious manner. This net of seal thongs is from thirty to forty feet in length and about five feet wide; floats of light wood are attached to one side, with pieces of stone for sinkers on the other side, and to the outer end is secured a stone somewhat larger than the rest, serving as an anchor; a number of short poles, about three inches in diameter, are lashed together to a length of sixty or eighty feet, and the end secured to the stone anchor by means of a loop, which allows the whole pole to be withdrawn after the net is set. This pole is used for pushing the net from shore into the desired depth of water; when let go the net naturally assumes a perpendicular position. The outer end is held in place by the stone anchor, while the inner end is fastened to a line of seal-thong leading to the shore, with which the net is drawn in."¹

The following are some of the food-fishes of Kotzebue Sound:

<i>Pleuronectes stellatus</i> .	<i>Mallotus villosus</i> .
" <i>glacialis</i> .	<i>Coregonus Laurettæ</i> .
<i>Limanda aspera</i> .	" <i>Merkii</i> .
<i>Pollachius chalcogrammus</i> (doubtfully).	" <i>Kennicottii</i> .
<i>Boreogadus saida</i> .	<i>Salvelinus malma</i> .
<i>Tilesia gracilis</i> .	<i>Oncorhynchus chouicha</i> .
<i>Cottus polyacanthocephalus</i> .	" <i>keta</i> .
" <i>tæniopterus</i>	" <i>nerka</i> .
" <i>humilis</i> .	" <i>kisutch</i> .
<i>Ammodytes personatus</i> .	" <i>gorbuscha</i> .
<i>Osmerus dextex</i> .	<i>Clupea mirabilis</i> .
" <i>spirinchus</i> .	

3. ARCTIC ALASKA NORTH OF KOTZEBUE SOUND.—From Kotzebue Sound northward the Eskimo are engaged principally in the capture of seal, walrus, and whale. Many of them go with whaling vessels, and all who are able to do so unite with a will in taking whales during the absence of the fleet as well. In the spring of 1880, the Point Hope men sold the bone from five whales which they killed after the vessels left in 1879. Natives all along the coast from Kotzebue Sound up are supplied with whaling gear such as the whites use, and in their trustworthy oomiaks they show great skill and courage in this chase. Whalebone is brought out to every vessel that comes in sight anywhere in the Arctic. The season of 1880 was a remarkable one for all concerned in the fishery; the Eskimo were fairly gorged with blackskin and blubber, while every sail carried away a heavy cargo of oil, bone, and ivory. On the 20th of August, 1880, the settlement of Point

¹ Report of Cruise of Corwin, 1881, p. 59.

Hope showed no signs of life, the natives being off fishing, hunting, and perhaps trading. There were plenty of drying-frames, and at various points along the low shore were large conical piles of drift-wood.

The spear-points observed at Cape Lisburne were made of copper or iron in a bone socket. Sometimes chert or some other hard stone replaces the metal. At Icy Cape a great number of chert flakes were found at an old Eskimo encampment, where the spear-maker had been at work. The pole to which the head is attached is usually nearly six feet long, the shank forming a socket fitting on a pivot on the pole and firmly lashed on. To the pole is fastened, by seal-skin thongs, an inflated seal-stomach. The natives throw these lances into a whale and the buoys prevent his sinking very far; each time when he comes up to breathe more and more lances are thrust into him, until finally the death stroke is given. The flesh and blubber are common property; the whalebone belongs to the captors of the animal. The jaw-bone is used for various purposes; cut into strips of suitable thickness, it is employed for shoeing sled-runners; the ribs and parts of the jaws are frequently planted in the ground in a circle for the frame-work of winter dwellings; blubber-holes are secured by a covering of similar bones; ribs also are sunk upright into the ground to serve as posts for stretching lines and for supports of various kinds. It is hard to tell whether the Eskimo prefer whale meat fresh or tainted; they eat it very freely and with apparent relish when it becomes simply revolting to our taste. The crisp, hard cracklings left by the whalers after trying out the oil are eagerly sought for by traveling parties.

The walrus and the seal are of more importance to the Eskimo than the whale, both of them being more readily obtained and supplying a greater number of wants. The flesh of the whale of course serves as food, the oil as food and fuel, the bone for house-frames and certain utensils, the baleen as an article of trade; but whales are hard to capture and are not to be depended upon, while walrus and seal, judging from the numerous remains of these animals found wherever we landed on the Arctic shores, and from the numberless appliances for which they serve, are the great essentials, not only to the comfort, but to the very existence of the natives. To use the language of Captain Hooper: "The seal may be called the mainstay of the Innuits of Arctic Alaska. The flesh and oil form his chief articles of subsistence; the skin furnishes him clothing, tents, and boats; cut into thongs, it is used to make nets for catching fish and birds. The oil is also burned in lamps (*nannue*), which light and warm the *tupecks* during the long, dark winter nights."¹

In the vicinity of Icy Cape we saw great quantities of broken skulls of walrus and seal and of polar bear. Heaps of burned bones were quite frequent; the natives burn the bones to appease the spirit dwelling in the animal, fearing a failure in their future hunting if this mark of respect be withheld.

Walrus ivory has many uses besides that of a basis of trade; whole tusks of the proper shape are formed into handsome and very effective ice-picks; snow-knives, resembling somewhat in shape the throw-sticks of some Indians, are made of this ivory; numberless implements of small size but great usefulness are manufactured from the same material.

The number of species of edible Arctic fishes is small, and there is no question that fish-food is much less important to those Innuits than the flesh of seals and walrus, but it is consumed in considerable quantities and forms a very agreeable variation from the ordinary diet. Two species of flat-fish are known to be abundant, and the small polar cod is superlatively so. Two sculpins named in the appended list (species of *Cottus*) reach a large size and they are very common. All

¹ Report of Cruise of Corwin, 1881, pp. 58, 59.

the lagoons observed by me were well filled with sticklebacks and young sculpins. Lant and capelin abound. Smelt and grayling are reported as far around as Colville River by Capt. E. E. Smith, ice-pilot of the *Corwin* in 1880. A species of whitefish (*Coregonus Laurettæ*) was obtained in abundance by Captain Hooper from natives at Point Barrow. We took the red-spotted trout in our seine, and Captain Smith reports it from Colville River, where he also secured herring and humpback salmon (*Oncorhynchus gorbuscha*). Seemann has declared that salmon are not found in Alaska north of Kotzebue Sound. This is an error; we found remains of a species of *Oncorhynchus*, which I believe to be *gorbuscha*, at Icy Cape, and Captain Smith, referred to above, salted in 1875 two barrels of humpback salmon which he bought at the mouth of Colville River. Concerning the whitefish of Point Barrow, Captain Hooper in his report, already referred to, says: "We bought from the natives . . . some fish resembling shad, but smaller and very fat; they differ also from the shad in having two (dorsal) fins. We saw the same species in Kotzebue Sound and at other places within the Arctic circle. They are called by the natives *tupook*."

Farther on he writes thus: "The salmon is the only variety of fish in the Arctic that is of any value. Although smaller than the salmon caught farther south, they are of fine flavor. They are quite plentiful, and the coast natives cure large quantities of them by smoking and drying for winter use."

The list of fishes given includes only such food-fishes as are known to occur; there are no doubt others which will be discovered by collectors in the future. The methods of capture do not differ from those already described, seines, gill-nets, hooks, and spears being employed just as they are farther south.

The following is a partial list of Arctic-Alaskan fishes:

<i>Pleuronectes stellatus</i> .	<i>Osmerus dentex</i> .
" <i>glacialis</i> .	<i>Mallotus villosus</i> .
<i>Boreogadus saida</i> .	<i>Coregonus Merkii</i> .
<i>Lycodes coeruleus</i> .	" <i>Laurettæ</i> .
<i>Cottus polyacanthocephalus</i> .	? <i>Thymallus</i> . (<i>Fide</i> Smith.)
" <i>tæniopterus</i> .	<i>Salvelinus malma</i> .
" <i>humilis</i> .	<i>Oncorhynchus gorbuscha</i> .
<i>Gymnacanthus pistilliger</i> .	<i>Clupea mirabilis</i> .
<i>Ammodytes personatus</i> .	

17. STATISTICS OF THE ALASKAN FISHERIES IN 1880.

Salmon exported from Alaska, 1880.

	Month.	Barrels.	Number.	Pounds.
Karluk River Fishery, Smith & Hirsch	June	125 ¹	37,500	375,000
Do	August	399	19,950	199,500
Do	September	415	20,750	207,500
Karluk River Fishery, Western Fur and Trading Company ..	June	265	20,000	200,000
Do	July	240	12,000	120,000
Do	August	150	7,500	75,000
Kassilov Fishery, Western Fur and Trading Company	July	160 ²	8,000	820,000
Do	August	185 ³	18,500	185,000
Kenai River Fishery, Alaska Commercial Company .....	.....	150 ²	7,500	300,000
Total .....	.....	2,089	151,700	1,982,000

¹ Barrels of bellies.

² Chowichee bellies.

³ Silver or keezitch.

Fish exported from Alaska, 1880.

Name of company.	Herring.		Halibut.		Cod.			Frost-fish.	Salmon trout.	Salmon.	
	Smoked.	Salted.	Smoked.	Fins and napes.	Dried.	Boneless.	Tongues.			Smoked.	Salted.
	Boxes.		Pounds.	Pounds.	Pounds.	Pounds.	Pounds.	Barrels.	Barrels.	Pounds.	Barrels.
Alaska Commercial Company.											150
Smith & Hirsch.											939
Western Fur and Trading Company.	500	pounds, 2,500 ½-barrels, 6 barrels, 18	500	250	3,000	10,500	250	2½	7½	4,000	1,000
Value		\$180	\$50	\$25	\$60	\$505	\$25	\$17	\$75	\$200	\$19,820

* 2,089 barrels equal 151,700 fish, equal 1,982,000 pounds.

18. TABLE SHOWING THE GEOGRAPHICAL RANGE OF FOOD-FISHES IN ALASKA.

Names.	Stikine River.	Wrangell.	Sitka.	Port Althorp.	Yakutat Bay.	Cook's Inlet.	Katmai.	Kodiak.	Belkoffsky.	Shumagin.	Unalashka.	Atka.	Kyaka.	Amelika.
<i>Pleuronectes stellatus</i>			x		x	x		x			x			
" <i>glacialis</i>														
" <i>quadrituberculatus</i>								x						
<i>Lepidopsetta bilineata</i>			x		x	x		x		x	x			
<i>Limanda aspera</i>			x					x		x				
<i>Hippoglossoides elassodon</i>								x		x	x			
<i>Hippoglossus vulgaris</i>			x	x		x		x		x	x			
<i>Atheresthes stomias</i>								x		x				
<i>Pollachius chalcogrammus</i>						x		x		x	x			
<i>Boreogadus saida</i>														
<i>Gadus morhua</i>			x		x	x		x	x	x	x			
<i>Microgadus proximus</i>					x									
<i>Tilesia gracilis</i>						x		x						
<i>Lota maculosa</i>														
<i>Lycodes Turnerii</i>														
" <i>coccineus</i>														
<i>Cottus polyacanthocephalus</i>			x		x	x		x		x	x			x
" <i>tæniopterus</i>														
" <i>niger</i>										x				
" <i>humilis</i>														
<i>Gymnacanthus pistilliger</i>											x?			
" <i>galeatus</i>											x			
<i>Hemilepidotus trachurus</i>			x	x		x					x		x	
" <i>Jordanii</i>				x		x		x		x	x			
<i>Melletes papilio</i>														
<i>Sebastichthys maliger</i>			x											
" <i>caurinus</i>			x											
" <i>brevispinis</i>				x										
" <i>melanops</i>			x					x						
" <i>ciliatus</i>														
<i>Hexagrammus asper</i>			x		x	x					x	x		
" <i>ordinatus</i>			x							x	x			
" <i>superciliatus</i>			x		x			x			x			
" <i>scaber</i>											x			
" <i>decagrammus</i>			x	x							x			x
<i>Pleuragrammus monopterygius</i>								x		x	x	x		

Table showing the geographical range of food-fishes in Alaska—Continued.

Names.	Stikene River.	Wrangell.	Sitka.	Port Althorp.	Yakutat Bay.	Cook's Inlet.	Katmai.	Kodiak.	Belkofsky.	Shumagins.	Unalashka.	Atka.	Kyska.	Anchitka.
<i>Ophiodon elongatus</i>			x	•										
<i>Anoplopoma fimbria</i>			x											
<i>Bathymaster signatus</i>			x							x	x			
<i>Ammodytes personatus</i>			x			x		x		x	x			
" <i>alascanus</i>			x											
<i>Esox lucius</i>														
<i>Osmerus dentex</i>														
" <i>spirinchus</i>														
<i>Mallotus villosus</i>			x			x		x						
<i>Hypomesus olidus</i>														
" <i>pretiosus</i>					x									
<i>Thaleichthys pacificus</i>	x	x	x	x			x							
<i>Stenodus Mackenzii</i>														
<i>Coregonus Lauretta</i>														
" <i>Merkii</i>														
" <i>Nelsonii</i>														
" <i>Kennicottii</i>														
" <i>quadrilateralis</i>														
<i>Thymallus signifer</i>														
<i>Salvelinus malma</i>			x	x		x		x		x	x		x	
<i>Salmo purpuratus</i>			x					x						
" <i>Gairdneri</i>			x	<i>Gairdneri</i>				x						
" <i>irideus</i>			x											
<i>Oncorhynchus chonicha</i>						x		x		x	x			
" <i>keta</i>			x			x		x	x					
" <i>nerka</i>									x		x			
" <i>kisutch</i>			x		x						x			
" <i>gorbuscha</i>						x		x	x					
<i>Clupea mirabilis</i>			x	x	x	x		x			x			
<i>Catostomus longirostris</i>														
<i>Ammocetes aureus</i>														
Total.....			28	8	10	17	1	25	4	16	24	2	2	2

[illegible]

Table showing the geographical range of food-fishes in Alaska—Continued.

Names.	Attn.	Saint Paul Island.	Saint Lawrence Island.	Saint Michaels.	Yukon River.	Port Clarence.	Kotzebue Sound.	Diomedes.	North Alaska.	Cape Lisburne.	Point Belcher.	Point Barrow.	Colville River.	Coppermine River.
<i>Lycodes Turnerii</i>				x							●			
“ <i>coccineus</i>								x						
<i>Cottus polyacanthocephalus</i>				x							x			
“ <i>tæniopterus</i>				x							x			
“ <i>niger</i>		x												
“ <i>humilis</i>				x			x				x			
<i>Gymnacanthus pistilliger</i>														
“ <i>galeatus</i>														
<i>Hemilepidotus trachurus</i>														
“ <i>Jordanii</i>														
<i>Melletes papilio</i>		x												
<i>Sebastichthys maliger</i>														
“ <i>caurinus</i>														
“ <i>brevispinis</i>														
“ <i>melanops</i>														
“ <i>ciliatus</i>														
<i>Hexagrammus asper</i>				x		x								
“ <i>ordinatus</i>														
“ <i>superciliatus</i>	x													
“ <i>scaber</i>														
“ <i>decagrammus</i>														
<i>Pleurogrammus monopterygius</i>	x													
<i>Ophiodon elongatus</i>														
<i>Anoplopoma fimbria</i>														
<i>Bathymaster signatus</i>														
<i>Ammodytes personatus</i>						x					x			
“ <i>alascanus</i>														
<i>Esox lucius</i>					x									
<i>Osmerus dentex</i>				x		x								
“ <i>spirinchus</i>							x							
<i>Mallotus villosus</i>				x						x	x			
<i>Hypomesus olidus</i>				x										
“ <i>pretiosus</i>														
<i>Thaleichthys pacificus</i>														
<i>Stenodus Mackenzii</i>					x									
<i>Coregonus Laurettae</i>					x	x						x		
“ <i>Merkii</i>				x					x					
“ <i>Nelsonii</i>					x							x		
“ <i>Kennicottii</i>					x							x		
“ <i>quadrilateralis</i>					x									
<i>Thymallus signifer</i>					x								x?	
<i>Salvelinus malma</i>					x	x			x	x			x?	
<i>Salmo purpuratus</i>														
“ <i>Gairdnerii</i>														
“ <i>irideus</i>														
<i>Oncorhynchus chouicha</i>					x									
“ <i>keta</i>				x					x					
“ <i>nerka</i>														
“ <i>kisutch</i>														
“ <i>gorbuscha</i>													x?	
<i>Clupea mirabilis</i>				x		x							x?	
<i>Catostomus longirostris</i>					x									
<i>Ammocetes aureus</i>					x									
Total	2	3	1	15	12	8	4	1	5	3	5	3	5	1

D.—THE FISHING-GROUNDS OF THE GREAT LAKES.

BY LUDWIG KUMLIEN AND FREDERICK W. TRUE.

19. LAKE SUPERIOR.

On account of the peculiar nature of the fisheries of the Great Lakes, the fishing-grounds are all located comparatively near shore. In considering them, we shall begin at the western end of Lake Superior, and proceed eastward and southward toward the eastern end of Lake Ontario.

ISLE ROYALE TO KEWEENAW POINT.—Gill-net grounds of considerable importance extend almost without a break along the northwestern and southern shores of Lake Superior, from Isle Royale to within a few miles of Keweenaw Point, a distance of more than three hundred miles. The bottom is everywhere clayey, except about the Apostle Islands, where it is sandy and rocky. On the northwest shore of the lake, the depth of water at the outer limit of the grounds varies from eighty to one hundred and forty fathoms, but on the south shore it is much less, being not greater than eighty fathoms at any point.

The grounds on the northwest shore are visited by Duluth fishermen in the fall. They fish commonly about forty-five miles from the village, but frequently go forty or fifty miles further north. In the spring and summer they set their nets at different points along the south shore, between Duluth and the Apostle Islands, but in the earlier part of the season they fish mostly at a station about twenty miles east of the village.

A portion of the grounds, extending eastward from the Apostle Islands one hundred and twenty-five miles, is visited by the fishermen of Bayfield and Ashland. The most favorable localities are off Iron River and Little Girl's Point, and in the vicinity of the Porcupine Mountains and Sleeping River. Different stations from Bark River to beyond Ontonagon are occupied at different times, according to the season and the movements of the fish. In the fall the nets are removed from the south shore and carried across the lake to Isle Royale.

The pound-net grounds of this district are located among the Apostle Islands and in the immediate vicinity. Other portions of the coast are too much exposed to the violence of storms, and in other respects are unsuitable for pound fishing. We may except, however, the sandy bar near the entrance to Superior City, where, in 1879, two pounds were located. During the same year one pound was set in Bark Bay, three in Siskowit Bay, sixteen among the Apostle Islands, mainly inshore, and from the islands nearest the mainland, and seven on the south side of the long sandy bar at the entrance of Chaquamegon Bay.

The most westerly seining-grounds of the lakes are at Superior City and Fond du Lac. In the former locality a very little seining for whitefish is prosecuted late in the fall. At Fond du Lac, at the head of Saint Louis Bay, the seining is more extensive, but the catch consists entirely of pike. There are many seining-reaches farther to the eastward, between Bark River and Bayfield, particularly in the smaller bays and among the islands, but the grounds are changed so often that it is quite impossible to locate them accurately. Bark Point, however, may be mentioned as one of the most favorable localities.

In winter small quantities of pike are taken in different parts of Saint Louis Bay with hook and line, and in the deeper passages among the islands near Bayfield considerable numbers of trout are caught.

ISLE ROYALE.—The fishing-grounds at Isle Royale are mostly off the south shore. The bottom is rocky for more than a mile from the island, but becomes clayey beyond. The fishermen set their gill-nets on the inshore rocky reefs early in the fall, but later in the season follow the fish into deeper water. They frequently set their nets in one hundred fathoms of water. The catch consists principally of trout. The Isle Royale grounds are frequented by the fishermen of Bayfield and of other localities on the south shore of Lake Superior.

KEWEENAW POINT TO GRAND ISLAND.—Gill-net grounds extend along this entire stretch of coast, except between Big Bay Point and Sauk's Head, a distance of about fifteen miles. The land is high at many points, and the water deep at a short distance from shore. The inshore bottom is rocky, but between Keweenaw Point and Big Bay Point it changes to clay and mud farther out, while from Sauk's Head to Grand Island sand and gravel largely predominate. The outer limit of the grounds is uniformly about seven miles from shore, where the water is forty or forty-five fathoms deep, except opposite Marquette and Train Bay, where the fishermen frequently fish ten miles from shore, in water from fifty to seventy fathoms deep.

The fishermen of L'Anse and the neighboring villages commonly set gill-nets in the fall on the west side of Keweenaw Point, opposite the entrance to the Portage Lake canal. In winter they keep near shore, generally fishing in L'Anse Bay, but in warmer weather they venture into deeper water, visiting various reefs and shoals, the position and extent of many of which is known only to themselves. A large share of the fishing is also carried on in the vicinity of the stations where pound-nets are set.

All fishing prosecuted between Sauk's Head and Grand Island is carried on by fishermen from Marquette. In the fall the grounds off Shot and Granite Points are visited, while in the spring the larger proportion of the gill-netting is prosecuted off Big Presqu' Isle and in the vicinity of Grand Island.

The principal pound-net stations of this section of the shore are at Bete Grise Bay, Portage Entry, Keweenaw and Huron Bays, the shallow bay east of Marquette, and the channel between Grand Island and the mainland. Between Keweenaw Point and Sauk's Head the nets are set in seventeen to forty-five feet of water, while further to the eastward the extremes are twenty and twenty-eight feet. During the year 1879 the pounds were distributed as follows: In Bete Grise Bay, one; at Portage Entry, two; in Keweenaw and L'Anse Bays, seven; in Huron Bay, two; between Granite Point and Presqu' Isle, one; between Marquette and Shot Point, three; and in the channel between Grand Island and the mainland, four. In 1878, and again in 1880, there were two more pounds at Grand Island. Some of the more intelligent fishermen of Marquette are now seeking some reef or shoal within convenient distance of that village, where they may catch larger quantities of fish. All the shoals now known are so far distant that they are unable, with their sail-boats, to reach them and return in one day. Many of the best pound-net grounds cannot be utilized on account of their exposed position. Even in the more sheltered localities, in stormy seasons, serious losses of netting are frequently sustained.

Small and unimportant seining-grounds exist at L'Anse and Portage Entry. Eastward the seining is prosecuted entirely in and about Marquette Harbor, and even these grounds are productive of very little except herring.

Stannard's Rock, a dangerous reef lying about forty-five miles due north of Marquette, is one of the most important trout-grounds of the Great Lakes. Marvelous stories are told

regarding the quantities of trout taken there. The grounds extend ten or twelve miles from the rock in every direction, and the water at the outer limit is more than one hundred fathoms deep in many places; the bottom is rocky and clayey. It is a very favorable place for hook-fishing, and is visited from time to time by the fishermen of Marquette.

GRAND ISLAND TO SAULT DE STE. MARIE AND DETOUR.—There are but few fishing-grounds along the south shore of Lake Superior east of Grand Island, except at Whitefish Point. Gill-net grounds extend a few miles on either side of the point, and five or six miles from land. The water is comparatively shallow and the bottom everywhere sandy. A tug visits the western grounds at certain seasons. The fishermen state that the water has receded considerably at this point within the past five years, and that fisheries of all kinds, except gill-netting, have been less successful than formerly.

The exposed condition of the coast about Whitefish Point renders the successful establishment of pound-nets quite impossible. During 1879, however, one net was set a short distance west of the point, and another to the south of it, in Whitefish Bay.

Large quantities of whitefish are caught with dip-nets in the rapids at Sault de Ste. Marie by the Indians. Not infrequently several hundred pounds are taken by a single canoe in one day. Grounds of limited extent exist in Whisky Bay, on which small quantities of fish are taken with trap-nets.

20. LAKE MICHIGAN AND THE STRAITS OF MACKINAC.

POINT DETOUR TO SEUL CHOIX POINT.—The fishing-grounds in the Straits of Mackinac and vicinity are widely scattered and difficult of location, and it is quite possible that some of them have escaped observation.

The first important gill-net ground west of Detour Passage extends from Strong's Island, about sixteen miles in a southeasterly direction, to and about Spectacle Reef. The water is very deep in the southern part of this ground, in some places approaching three hundred fathoms, but about Spectacle Reef and near shore it is of course comparatively shallow, although in some spots, in very close proximity to the former, from forty to sixty fathoms may be found. The nature of the bottom differs very much in different parts of the ground, but mud, sand, and rock predominate. This ground has the reputation of being exhausted at the present time, and very little fishing is prosecuted on it.

Some little gill-net fishing is carried on between Mackinac and Round Islands and to the westward of the latter, and also for a short distance along the shore north of Point Saint Ignace. These grounds are frequented, however, only by fishermen using but ten or twenty nets, who sell their fish to the steamers and hotels.

The whole northern shore of Lake Michigan, from the straits to Seul Choix Point, is one vast gill-net ground. It is considered one of the best on the lake. Fishing is carried on at a distance of ten, fifteen, or even twenty miles from land. The favorite grounds are southeast of Point Patterson, between Simmons's Reef and Point Epoufette, westward of Saint Helena Shoal, and southwest of Point aux Chenes. On the first-mentioned ground the bottom is chiefly sandy, but on the others the sand is largely mingled with rock and clay. The depth of water does not exceed sixteen or eighteen fathoms at any point, the average depth being considerably less.

The boats fishing on these shoals belong at different points along the north shore and at Mackinac. Many Beaver Island boats also fish here, especially on the southern borders of the grounds.

Between Detour Passage and the Straits of Mackinac there are but two permanent pound fisheries. One is located at Strong's Island, the most easterly of the Les Cheneaux group. Seven pounds were employed here in 1879. It is a very important and productive fishery. The second is situated at the head of Saint Martin's Bay, where, in 1879, six shoal-water pounds were established.

On the north shore of Lake Michigan, west of the Straits of Mackinac, we find the most extensive and profitable fishing-grounds of the lake, as regards both pound-net and gill-net fishing. The first pound-nets to the eastward are those established at Gros Cap Point, eight and one-half miles west of Point Saint Ignace. The "Six-mile sand-beach," further to the west, at Point aux Chenes, is a noted and productive ground. From this point westward we find pound-nets scattered along the shore at Point Epoufette, Biddle Point, Mille Coquins Point, Point Patterson, and Scott's Point. Between Point Saint Ignace and Scott's Point, a distance of less than fifty miles, there were located in 1879 more than sixty pound-nets, and about seventy-five gill-net boats also fished there.

Along this coast the pound-nets are all set quite close inshore, and generally each man's nets in a line. Prominent exceptions, however, are furnished in the case of two firms, each of which sets two nets on a shoal about seven miles south of Mille Coquins Point. Another firm has nets set in deep water about nine miles south-southwest of Point Epoufette, and two more are set a short distance west of Simmons's Reef, and about the same distance directly south of Point Epoufette. The latter two are among the most profitable pound-nets on this shore.

THE BEAVER ISLANDS.—The shores of the Beaver Islands present very favorable conditions for the establishment of pound-nets, and they have therefore become the center of an extensive fishery. The bottom consists chiefly of sand, although in some parts, especially on the west shore of the main island, rocky grounds are very abundant.

In 1879 thirty-two pound nets were in use at the islands, sixteen of which were located on the east side of the large island which gives its name to the group, and constituted the Sand Bay fishery. Of the remaining nets, two were located at the north shore of Hog Island, two at High Island, and the others at the north, east, and south shores of Beaver Island.

At Beaver Harbor, near Saint James post-office, in the northeastern portion of Beaver Island, there is an extensive seining-reach, where, in 1879, two seines were employed.

Off Gull Island, the most westerly of the Beaver group, is a noted gill-net ground. The island is owned by three persons, each of whom employs two boats in the fishery.

SEUL CHOIX POINT TO POINT DETOUR, GREEN BAY.—The only fishery between Seul Choix Point and Point Detour is located at Point aux Barques, where, in 1879, sixty gill-nets were employed. The ground extends about four or five miles from the point, the outer limit being in about twenty fathoms of water. The bottom is generally hard and sandy.

GREEN BAY.—The fisheries of Green Bay are very extensive, and quite varied in character. The bay is a body of water of no mean proportions, being about two hundred miles in length and twenty miles in breadth at the widest part, or somewhat more than twice the size of Lake Champlain. There are many large and flourishing towns on the west shore, while the east shore is comparatively unoccupied.

In considering the fishing-grounds we shall begin at Point Detour, at the entrance of the bay, and having spoken of the grounds in Big and Little Bays de Noquette, pass southward along the west shore to Green Bay City, and thence northward along the east shore to Porte des Morts.

At the entrance of Green Bay, extending around Summer Island, within a radius of about six miles, we find an important gill-net ground, known as the Sag Bay ground. West of and adjoining the Sag Bay ground is another, six or eight miles in diameter, called the Summer Island ground. As many as three hundred and fifty gill-nets are annually employed there. Extending in a southwesterly direction from the grounds already mentioned, and directly north of Washington Island, is still another and much larger ground styled the Washington Island ground. Every summer about six hundred gill-nets are in use here, and in the fall the number swells to one thousand. The bottom, as might be expected on account of the great extent of the ground, varies considerably in character, but is generally hard and sandy. The water is comparatively shallow, the maximum depth not exceeding twenty-three or twenty-four fathoms.

There are no extensive gill-net grounds in either Big or Little Bay de Noquette, although in the latter some nets are used in winter under the ice. A few miles south of the entrance to Little Bay de Noquette, and east of Indian Town, we find a ground which supports about one hundred and thirty-five nets. The character of bottom and depth of water are about the same as those of the Washington Island ground, which, in fact, it touches at its western limit.

Between this ground and the next to the southward, a space of about five miles intervenes. The latter ground extends from near shore, in a southeasterly direction from the mouth of Bark River, about nine miles. The depth of water at the outer limit is about seventeen fathoms, and the character of the bottom is similar to that of those previously mentioned.

Farther south there are no more important "open-water" gill-net grounds, or such as are visited during the warmer weather, either on the west or east side of the bay, except at Green Bay City. The grounds extend for about two miles along the low and marshy shores at the mouth of Fox River. The nets are set in the numerous sloughs running into the marsh, and are visited every two days. Nothing is taken in them but rough fish. The only large ground still unmentioned is the Saint Martin's ground, which extends from the island of the same name into Lake Michigan eastward, northeastward, and southeastward, about eight miles.

As we have stated already, "open water" gill-net fishing has died out almost entirely south of the Bark River ground except at Green Bay City. One fisherman set a few gill-nets in 1879 directly north of the bar at the mouth of the Peshtigo River. Summer gill-net fishing is also carried on to a limited extent on the east shore, between Bay Settlement and Chambers Island, especially at the entrance of Little Sturgeon Bay, where formerly it was extensively pursued.

In winter, as soon as the ice is sufficiently firm to be walked upon with safety, the fishermen begin setting their nets. The grounds are located almost anywhere outside the ten-fathom line, often in the middle of the bay, and the nets are moved from time to time. Very few are in use north of Menomonee, many of the more important pound-owners not possessing any. Southward as far as Peshtigo they increase in number. A few are set off Suamico and between Bay Settlement and Chamber Island, on the east shore. They are set across the bay, in gangs of from five to thirty, and anchored.

The pound-net fisheries of Green Bay are very extensive and important. The larger proportion of the nets are set on the west shore, between Cedar River and Green Bay City, but many are also scattered over other parts of the bay.

On the north shore of Saint Martin's Island, at the entrance of the bay, we find the largest and deepest pound-net on the Great Lakes. The pot stands in ninety-seven feet of water, and is inclosed by stakes one hundred and twenty-five feet long, spliced three times. The net cuts off a deep channel by which the fish appear to enter the bay, and the catch is very large.

On the west shore of Big Bay de Noquette, between Saint Vital Point and Chippewa Point, seven pounds were in operation in 1879. The shores of the bay are unsettled, and the region is too far away from any shipping point to enable men to carry on the fisheries successfully. It is believed, however, that the bay abounds in fish.

At the mouth of Big Bay de Noquette, about midway between Peninsula Point and Summer Island, and nearly seven and one-half miles from any land, there is a small pound-net ground, where, in 1879, five pounds were located. The bottom is hard, and the depth of water varies from six to eight fathoms. The ground is very productive.

On the eastern shore of Little Bay de Noquette, directly opposite Escanaba, there were, in 1879, three pounds; at Masonville, at the head of the bay, one; and on the west shore of the entrance of the bay, about five miles south of Escanaba, three. The latter are so near the mouth of the bay that whitefish are caught in them in considerable quantities.

Directly opposite Indian Town, on the west shore, and about six miles from land, we find two more pound-nets. They are set in about thirty feet of water, and are very productive. They are about the only pounds that take considerable quantities of trout. A few miles farther south, but close inshore, there are two more pounds.

Between Cedar River and Little Tail Point, ten or twelve miles north of Green Bay City, we find a remarkably large number of pound-nets. In 1879 there were no less than one hundred and twenty nets situated along this section of coast. In the vicinity of Cedar River the water is very deep near shore, many of the pounds being in seventy-five feet of water, but southward the shore slopes more and more gently, forming sandy reaches, over which the water is but twenty or thirty feet deep. Between Menomonee and Suamico the nets are set on these shoals.

About four miles above the mouth of Little Suamico River, and three and one-half miles from shore, a rocky reef, nearly three miles in length, extends north and south. One net is usually set inside the reef and three placed in line east of it, the one farthest eastward being about five miles from shore.

The catch in all the pounds on this section of coast consists principally of herring.

The pound-net grounds of Green Bay City are located near the mouth of Fox River, in about fifteen feet of water. Four large pound-nets and seventeen "baby-pounds" owned in the city, together with a number of others, were employed here in 1879.

At the present time the pound-net grounds of the east shore of Green Bay are located between Shoemaker's Point and Little Sturgeon Bay. The whole extent of coast occupied is not more than six miles. Two nets are also set off Chambers Island. The latter grounds were formerly of great importance, but they are now almost abandoned.

At the head of Big Bay de Noquette, in Ogontz Bay, there is a single seining-reach, and another at the head of Little Bay de Noquette. The catch in these nets consists chiefly of rough fish and sturgeon, whitefish and trout not being found so far up in the bays.

There are but four seining-reaches on the west shore of Green Bay which are now visited by the fishermen. Two are located a short distance south of the mouth of the Menomonee River. There is also one at the mouth of the Suamico River, and one at the mouth of the Oconto River. Both, however, are insignificant, no large hauls having been made within seven years. Formerly seining was a leading industry in this section, but many of the old grounds are now occupied by pound-nets. From 1858 to 1865, seines were used on all suitable shores in this vicinity, and large quantities of fish were taken.

At Green Bay City five large seines were in use in 1879. The yield of this fishery is very large.

On the shoals south of Green Island, which is situated in the middle of the bay, southeast of Menomonee, hook-fishing is prosecuted to a considerable extent. Prior to 1867, this fishery was quite extensive and important.

At Green Bay City about one hundred and fifty fyke-nets are set in Fox River, near the mouth, and various species are taken.

Hook-fishing is carried on on the east shore of Green Bay, in Door county, to a very limited extent.

De Pere being situated at the head of Fox River, and not directly on Green Bay, its fisheries may be more properly considered separately, although they are of little importance. The catch consists principally of dory, pickerel, catfish, and sturgeon, but some whitefish are also taken. A number of small gill-nets are used and two seines, together with about one hundred dip-nets. In the latter many kinds of fish are taken, such as moon-eyes, which are only used for manure or as bait for catfish.

PORTE DES MORTS TO PORT WASHINGTON.—The first gill-net grounds on the west shore of Lake Michigan, south of Porte des Morts, are near Jacksonport, around the Cana Islands. Gill-net fishing was formerly prosecuted here to a considerable extent, but pound-nets have gradually taken their place so that only about a hundred gill-nets remain between Porte des Morts and Clay Banks, a distance of about thirty miles.

The next gill-net ground is at Clay Banks. It extends about two miles north of the village and the same distance south of it. At the outer limit the water is from ten to fourteen fathoms in depth and the bottom is everywhere rocky. The principal species of fish caught here is the trout.

About four miles south of Clay Banks we find another small gill-net ground. In 1879 there were two small gangs of fishermen here who employed gill-nets in taking trout. As a rule they fish in not more than ten fathoms of water.

Between Stony Creek and Two Creeks on the south, a distance of about twenty-five miles, there are no fishing grounds of any sort. At Two Creeks, however, we reach the upper end of the great gill-net grounds, frequented by the fishermen of Two Rivers. These grounds extend from nearly opposite Two Creeks on the north to Manitowoc on the south, a distance of about fourteen miles. The inner limit of the grounds is uniformly about two miles from shore, where the water is from ten to fourteen fathoms in depth. At the outer limit of the grounds, about ten miles from shore, we find eighty or ninety fathoms of water. This outer region, however, is visited only by the tugs, the smaller Mackinac boats fishing closer inshore. The catch consists chiefly of trout, blackfins, and lawyers.

Passing southward we find the next gill-net ground opposite Sheboygan. This ground extends from two and one-half to eighteen miles from shore, the water varying from twelve to sixty or seventy fathoms in depth. This ground was abandoned in 1866 on account of the scarcity of fish, but a few years later, fishing being resumed, the yield was as large as, or larger than, ever before known.

The most northerly pound-net ground on this section of coast is located at Jacksonport. The grounds are situated a little to the southward of the village, and the nets are usually set about a mile from shore. At Whitefish Bay, about seven miles south, is one of the oldest and best known whitefish grounds on the lake. The bottom here is ridgy, clay and gravel alternating in furrows. This kind of bottom is believed to be that most frequently visited by whitefish.

The next pound-net ground to the southward is located between Two Creeks and Manitowoc, and between the shore and the outer limit of the great Two Rivers gill-net ground. The bottom

is generally sandy and the maximum depth of water not more than six or seven fathoms. In 1879 thirty-three pounds were situated here.

Another pound-net ground is located about thirteen miles north of Port Washington, opposite the small village called Amsterdam. The ground extends about four miles north and south. The bottom is everywhere sandy. The pounds are usually set in from twenty-five to sixty feet of water. Pound fishing was first introduced here in 1862.

At Oostburg there is a pound-net ground extending along six or seven miles of shore. The outside nets are located about a mile from shore.

At Port Washington the nets are usually set in from thirty to fifty-five feet of water, the majority being in about forty-five feet.

There are no shoals or reefs in the immediate vicinity of Jacksonport, but at a distance of twenty-five miles there is an extensive shoal which was formerly a very famous trout ground. It is now seldom visited.

PORT WASHINGTON TO SOUTH CHICAGO.—The most important gill net grounds within these limits are in the vicinity of Milwaukee. The fishermen set their nets in a southerly and southeasterly direction from Milwaukee from ten to forty miles, northward to northeastward forty to ninety miles, and eastward from fifteen to fifty miles. The principal outside ground is the Big Reef, which is situated directly opposite Milwaukee, at a distance of about forty miles, but runs in a southeasterly and northwesterly direction, so that its most northerly limit is only about fifteen miles off shore opposite Port Washington. Inside of this reef and only about six miles from shore there is another productive ground.

During summer the fishermen go to the outside reef, but in the fall, when the fish are spawning, they visit the inner one. Mr. Schultz, of Milwaukee, states that there are apparently less fish on the outer reef than there were twenty-five or twenty-six years ago, but that there has been no perceptible diminution on the other portions of the grounds.

The gill-net grounds at Racine extend from Wind Point, a short distance north of the city, to about four miles south of the city. The nets are usually set at distances of from three to twenty miles from shore, the water varying in depth from ten to seventy-five fathoms. The greater portion of the fishing, however, is done in water about twenty fathoms deep and from six to ten miles from shore. The catch consists principally of whitefish, trout, and lawyers, and rarely a few other kinds of no commercial importance.

We find the next gill-net ground about three miles south of Kenosha. The southern portion of this ground is about fifteen miles distant from shore. The boat fishermen fish from twelve to sixteen miles from shore, but the tugs sometimes go as far as twenty miles. At the outer limit of the ground the water is about seventy-five fathoms deep.

In the vicinity of Milwaukee the only pound-net station is in Whitefish Bay, a short distance north of the city. Only two nets were in use there in 1879.

In the vicinity of Waukegan pounds are set along the sandy beach for a distance of about twelve miles, the northern limit of the ground being about nine miles north of the city. The bottom slopes gently from the shore, and the character of the ground is such that there is no difficulty in driving the stakes firmly. The quantity of fish taken here is about one-fourth less than it was twenty years ago. In 1879 twenty-nine nets were located on different parts of this ground.

At Chicago a few nets are set directly off the mouth of the river in comparatively shallow water, and at South Chicago also the pounds are located very near shore.

SOUTH CHICAGO TO SAUGATUCK.—There are no fishing-grounds at the head of Lake Michigan, between South Chicago and Michigan City. Between Michigan City and Saint Joseph the gill-net grounds are situated a long distance from shore. In summer the fishermen commonly go seven to fifteen miles from shore, and in winter much farther. The water, however, on these grounds is comparatively shallow, at a distance of twenty miles being not more than twenty-eight fathoms. The bottom is principally sandy, but clay and gravel predominate in some places. From New Buffalo northward the grounds curve gradually outward, the outer limit opposite Saint Joseph being from eight to twelve miles in summer, and in winter from fourteen to twenty miles. Beyond Saint Joseph the outer boundary curves inward again, until at South Haven it is quite near shore. Although the distance to which the boats go is very great, the water is not deep at the outer limit, being scarcely more than sixty fathoms. A few miles south of Saugatuck and comparatively near shore there is a whitefish spawning-ground, which for a long time has been very productive. In 1879 the fishing at this point proved almost a failure. With the exception of this ledge, the bottom is generally sandy or clayey, and the fishermen set their nets almost anywhere in certain depths with equally good success. One fisherman stated that he had fished with his boat to a distance of twenty-five miles due west from Saint Joseph, but it is certainly dangerous for the fishermen to go such distances in small boats, although the steam-tugs, of course, can safely go much farther.

Hook-fishing is carried on on the same grounds opposite Saint Joseph.

In former years seining was carried on to a considerable extent on this coast, but at the present time the fish do not come inshore. It is supposed that the foulness of the rivers has driven them into deeper water.

The pound-net grounds of this section extend from a few miles south of Michigan City to New Buffalo. All the nets are set close inshore, in water from twenty-five to fifty-two feet deep. The bottom consists of hard sand, and is very suitable for the driving of stakes.

SAUGATUCK TO MANISTEE.—From Saugatuck northward the grounds gradually extend outward, and at Grand Haven it is not an unusual occurrence for a boat to go out thirty miles. North of Grand Haven the outer boundary again bends inward, and at Whitehall boats usually fish not further than from two to four miles from shore. The most productive parts of this ground are said to be at Whitehall and Muskegon, but as there are no good shipping facilities at these points, very little fishing is done. No particular kind of bottom is sought for by the gill-netters, the depth of water appearing to be a more important consideration. It is supposed that in cold weather the fish pass out into deeper water, as it is found necessary in winter to go a much longer distance from shore than in summer in order to find profitable grounds.

At Pentwater most of the gill-net fishing is prosecuted in about forty fathoms of water, though the fishermen occasionally go as far as fifteen miles from shore, where the water is seventy or seventy-five fathoms in depth. These grounds are considered to be less productive and to have been greatly damaged by mill refuse. At Ludington most of the fish are taken at a distance of about ten miles from shore, but northward the outer limit of the ground gradually comes nearer and nearer shore. The most productive portion of this ground is at Big Point Sable, although even here fish are much less abundant than formerly. In 1875 the firm of Wilson & Brothers had a line of gill-nets in use here, which was about eight miles in length.

But little gill-net fishing is carried on at Manistee. A few boats fish here in from nine to forty fathoms of water, the outer limit of the ground being about eight miles from the shore.

There are but few pound-net stations along this whole section of coast. A short distance on either side of Big Point Sable six pounds were established in 1879, set close inshore, in from thirty to forty feet of water. A short distance from Ludington one pound is in use.

MANISTEE TO CROSS VILLAGE, INCLUDING LITTLE AND GRAND TRAVERSE BAYS AND FOX ISLANDS.—The most southerly gill-net grounds of this section, of any importance, are situated on the west shore of Grand Traverse Bay between Cat-Head Point and Sutton's Point. Of these the most noted are at the entrance of Grand Traverse Bay, where vast numbers of blackfins are taken. One of the greatest spawning-grounds in the lake is situated off Light-house Point to the eastward and northeastward, but from its position it is so exposed to the winds, and the bottom is also so rocky, that no fishing can be done. South of New Mission Point there are no fisheries in Grand Traverse Bay, on the west shore, except in Sutton's Bay, where large quantities of herring are taken. On the east shore there is but one fishery, which is situated a little to the north of Torchlight Lake.

The most southerly pound-net station of this section is at Good Harbor Bay, where, in 1879, two nets were located. In Grand Traverse Bay there are several important stations, the one most worthy of notice being in Northport Bay. Six nets were in use here in 1879. Just north of Northport Point we find three more nets. At Hog Island, near the head of the west arm of Grand Traverse Bay, there is one pound-net station where one net is located. North of Grand Traverse, between Petoskey and Cross Village, there are three pound-net stations. Two are located on the north shore of Little Traverse Bay, and one farther northward near its mouth. Five nets in all were employed at these stations in 1879.

Important gill-net grounds extend from Charlevoix to Cross Village. The outer limit of the ground is about 4 miles from shore. Fishing is carried on at all seasons. The maximum depth of water is about 45 fathoms. The bottom is rocky and clayey.

Off the east shore of North Manitou Island there is a small gill-net ground, which is visited by three fishermen. The water varies from thirty to sixty fathoms in depth. The bottom is clay.

Due east of South Manitou Island, a distance of about three miles, there is one pound-net station.

Gill-net grounds extend about South Fox Island to the outer limit of the great sandy shoal which exists there. The fishermen fish on the north and east shores of Fox Island in summer, but in winter usually fish most extensively on the west shore. Between the two islands two pound-nets are located.

CROSS VILLAGE TO LAKE HURON.—Between Cross Village and Point Wangoshance there are a few pound-net stations, but in 1879 the fishery proved almost a failure. The shore is too rocky and exposed for successful fisheries of this sort. Two pound nets are set to the northward of Wangoshance, a few miles east of old Fort Mackinac.

21. LAKE HURON.

STRAITS OF MACKINAC TO ALCONA.—Very little fishing is done on the section of coast between Point Wangoshance and Thunder Bay Point. In Hammond's Bay, near the eastern entrance of the Straits of Mackinac, there are eleven pound nets.

The Alpena gill-net grounds are located east and north of North Point as far as, and beyond, Middle Island, the outer limit being about fifteen miles from shore. There is no gill-net fishing in Thunder Bay proper. It is estimated that the abundance of fish here is only one-third what it was ten years ago.

The pound-net stations in Thunder Bay are situated on the north shore, between North Point and Whitefish Point. Fifteen nets were located here in 1879. On the shore at the north of Sulphur Island, in four or five fathoms of water, there are four nets. The bottom on this ground is very hard and stony.

ALCONA TO POINT AUX BARQUES, INCLUDING SAGINAW BAY AND THE CHARITY ISLANDS.—Gill-net fishing is not prosecuted to any considerable extent on this shore. The pound-net fishing of Saginaw Bay is very important. The shores of the bay are very sandy, and great shoals extend from the shore, upon which pounds can be established very firmly. The most westerly station is at Ottawa Point, near the mouth of the bay, where two nets are located. Three other stations on the west shore of the bay are located at Gravelly Point, Point aux Grès, and south of the shoal at the mouth of Rifle River. At the head of the bay the stations are very numerous. They are set at approximately regular intervals along the whole shore between Nayaliquing Point and Fish Point. Not less than one hundred nets were in use within these limits during the year of the canvass.

The sandy shoal, on which the nets at the head of the bay are placed, extends out a great distance from the west shore, and in this part of the bay four lines of nets, comprising in all about fourteen, are located at distances of from six to eight miles from land. Three other stations are located respectively at North Island, the main shore about four miles north of Sebewaing, and at about two miles east of North Mineshas Island, at the edge of the inner shoal. The most easterly shoal occupied by pounds is that making off north of Sandy Point. Four lines of nets were in use here in 1879. Three lines of nets are also located on the shoals which extend from the Charity Islands, situated in the middle of Saginaw Bay near the mouth.

The Charity Islands fisheries are considered to be the most profitable on the whole chain of lakes. On the north and northeast portion of these grounds, however, the nets are greatly exposed to storms, and heavy losses frequently occur.

Seine fisheries are still carried on quite extensively in this district. At the head of the bay, on the west shore, there are several important seining reaches. The principal ones are situated, (1) near the mouth of the Saginaw River on the west side of the mouth of the Ogahkaning River, (2) midway between the Opinkawning and Saginin Rivers, (3) midway between the Rifle and Pine Rivers, and (4) on either side of Gravelly Point. The last three fisheries are carried on by the Indians. The one between Rifle and Pine Rivers is the oldest and best known seine-fishery in Saginaw Bay.

There are no gill-net fisheries in Saginaw Bay proper, but to the northward of Point aux Barques and Point au Sable there are several important grounds. Some gill-netting is still carried on in winter, but this branch of the fisheries has declined very much within the last ten years. The same may also be said of the seine-fisheries, but on the other hand the number of pound-nets has considerably increased within that time.

The winter fishing in Saginaw Bay is very important, and gives employment to a large number of men. Not only gill-nets and pound-nets, but hooks and spears are used, the last being by far the most convenient and effective device for the capture of fish. The location of the spearing grounds varies according to the season and the thickness of the ice. The fishery is usually carried on, however, outside of a line drawn from Point aux Grès to the west shore of Sebewaing. During a profitable season quite a village springs up on the ice, and a variety of supplies are brought out by the buyers of the fish. It is stated, however, that the fishery is becoming less and less profitable every year. A few years ago the spearing was so profitable that a supply of fish could always be

depended upon, but the experience of the last few years seems to show that the decrease has been so great that dealers will no longer depend upon obtaining a supply from the spearmen.

Besides the bay fisheries, there are quite a number of pound-nets located in Saginaw River, extending from its mouth about twenty miles inland. They are set in from ten to twenty-four feet of water, and large quantities of fish, especially pike, perch, and suckers, are taken. The river fishery differs somewhat from the bay fishery, inasmuch as it is only prosecuted in winter.

At the mouth of the Ogahkaning River, a pond about two acres in extent has been constructed for the purpose of keeping fish when caught in great abundance, so that when the amount of fish taken is small the fishermen may still be able to supply the demand of the dealers. The pond is now only six feet in depth, but the owners propose dredging it and also extending its area.

POINT AUX BARQUES TO PORT HURON.—Gill-net fishing is prosecuted all along the shore of Lake Huron from Point aux Barques to Port Huron, the principal stations being at Port Austin, Grindstone City, Huron City, Port Hope, Sand Beach, White Lake, Forestville, Port Sanilac, and Lexington. Fishing is carried on more or less extensively at all these points, but the most important are Sand Beach and Port Hope. The grounds extend from five to twenty-five miles from shore. The catch consists mainly of whitefish and trout.

There are no pound-nets in use between Point aux Barques and Port Huron, the shore being much exposed to the violence of storms. There are many seining reaches all along this section of coast, but the fishing is not carried on so extensively as formerly.

PORT HURON TO DETROIT, INCLUDING SAINT CLAIR RIVER AND LAKE SAINT CLAIR.—All fishing in Saint Clair River is carried on by means of seines. The grounds extend along twenty miles of the river, and there are in all five fisheries on the American side. Seines are also employed along the shore of the lake, but not so extensively as formerly. The season opens about the middle of May and lasts until August.

FISHING-GROUNDS ON THE DETROIT RIVER.—The fisheries in Detroit River, with the exception of those carried on by means of a few fykes and "baby" pounds, is prosecuted by the aid of seines about sixty fathoms in length. There are thirty fisheries on the river between Windmill Point at its head and Bar Point at its mouth. They are located both on the American and Canadian shores, and on the islands which occupy the central portion of the river. The most northerly are situated at Isle a la Pêche, at the head of the river. South of this, on the American side, there are two more reaches. On the east shore of Belle Isle there are three fisheries, and on the west shore one. South of Belle Isle there are no more until we have passed the city of Detroit. Off Fort Wayne, on the American side, there are four fisheries, and a little to the northward, opposite the town of Sandwich, on the Canadian side, one. The next five are on the Canadian side, the most northerly being about a mile north of Sandwich. On the west shore of Fighting Island there are five fisheries, and on the east shore of Grassy Island two. On the northeastern shore of Grosse Isle we find three fisheries; at Stony Island, further to the south, one, and at Sugar Island still another. The latter is the most southerly ground on the river. Many of these reaches are located on the mud banks that make off from the shore, but in some places the bottom is sandy and stony. The catch consists of whitefish and pike. A few days before the whitefish appear there is usually a run of herring, and a smaller mesh in the pockets of some of the seines is used for the purpose of taking them.

22. LAKE ERIE.

MOUTH OF THE DETROIT RIVER TO PORT CLINTON.—Along this section of shore fishing is prosecuted almost entirely with pound-nets. Stations extend without interruption from Bar Point, at the mouth of the Detroit River, to Port Clinton. Between these two points, in 1879,

there were not less than 425 pound-nets. Each company's nets are set in a line, the outer net being often four or five miles from shore. The fisheries of Toledo extend from Teal Ground to Locust Point.

Off Toussaint, about ten miles west of Port Clinton and three miles from shore, there is a gill-net ground of considerable importance. The bottom here varies greatly, in some portions being rocky and in others muddy or sandy. The water at the outer limit of the ground is about twenty-eight fathoms in depth.

Some seining is prosecuted in and about the mouths of the various rivers along this stretch of shore. At Portage River it is carried on only in winter. A few fyke-nets are set in Portage and Four Rivers as well as in some of the bayous, but the fishery is not important, although considerable quantities of inferior varieties of fish are taken.

PORT CLINTON TO VERMILLION.—The pound-net grounds continue without interruption along this section of shore. The fishing-grounds of Sandusky and vicinity may be divided into four great districts, each partaking of some peculiarity not shared by the others. They are generally spoken of as the Cedar Point fisheries, the bay fisheries, the island fisheries, and the main shore fisheries. The Cedar Point fisheries are the oldest and most important. They begin at Cedar Point, at the entrance of Sandusky Bay, and extend about six miles towards Huron. There are sixty-six nets in this district. Many of the outside nets are five and one-half miles from shore, the nearest being about one-half mile. They are set in from twenty to thirty feet of water, the average depth being perhaps about twenty-eight feet. The shore as well as the bottom of the fishing-ground is sandy. The catch here consists largely of herring, but great quantities of whitefish are also taken.

The bay fisheries are prosecuted not only with pounds but also with fykes and seines, the stations and reaches being scattered along both shores. The water in both the upper and lower bays being shallow, nets having a depth of five to twelve feet only are used.

The main shore fisheries extend from Sugar Bluff to the entrance of Sandusky Bay, the pound-net stations being scattered regularly along the shore. They are set in from twelve to thirty-five feet of water. The bottom is generally clayey. This fishery is noted for the large catch of herring, the next fish in importance being the catfish.

What are known as the island fisheries are situated about North, Middle, and South Bass Islands and Kelley's Island. On the North Bass Island there are but seven nets, though northward from the island there is an extensive whitefish spawning-ground. On the north of the island it is impossible to drive stakes on account of the rocky bottom. At Middle Bass Island there are twelve nets, many of them being set in thirty-five feet of water. The fisheries at South Bass Island are the most important of the group. On the shoals and reefs about the islands there are extensive and important whitefish spawning-grounds. The most productive of them, however, are those north of North Bass Island, in Canadian waters. At Kelley's Island there are twenty-three pounds, and the fishery would be very profitable were it not that vessels run through and destroy the nets. The principal fish taken on these grounds are herring, whitefish, and black bass. The seine-fishing in this locality is quite extensive and important. The principal grounds are located about Willow Point. In Sandusky Bay seine fishing is carried on all winter. The principal grounds are near the mouth of the Sandusky River.

North and northeast of Kelley's Island there are two reefs, which are frequented by sturgeon, and about two hundred gill-nets are set here annually.

The pound-net grounds of Huron extend about five miles east and the same distance west of the mouth of the Huron River. In 1879 seventy-four pounds were located in this district. Five

miles east of Huron there is a small whitefish spawning-ground, but the bottom is very rocky and only one net is located there. The pounds are set in from twenty-two to forty-two feet of water, most of them being from seventy-five rods to three and one-half miles from shore. The "driving bottom" in most portions of the Huron grounds is excellent, the outer portions being better in this respect than the inside grounds. The clay bottom of the lake is covered by layers of sand forming the best kind of "holding ground." The catch at Huron consists chiefly of herring; in fact, these grounds are considered the most favorable for herring fisheries of any on the lake. The general fishery is also very profitable, there never having been a failure since it was begun. The migratory varieties, such as whitefish, are taken only while passing, but herring and blue pike are always present in abundance. Such fish as go towards the head of the lake to spawn sometimes fail to reach that locality, and consequently there is liable to be a failure there, but small quantities, at least, are always caught on the Huron grounds. Very extensive herring spawning-grounds are situated here, and this fact possibly accounts for the extraordinary numbers of this fish which are taken here in autumn.

The Vermillion fishing-grounds occupy but a very small extent of shore, the nets being set at but one station and close together about four miles west of the mouth of Vermillion River. Nets are set in from thirty to forty feet of water, and from two and one-half to three and one-half miles from shore. The bottom is all clay, and very favorable both for driving the stakes and holding them firmly.

VERMILLION TO CONNEAUT.—The most westerly pound-net grounds of this section of shore extend from Vermillion to the mouth of Black River, a distance of about eleven miles. The next station to the eastward, known as the Dover Bay fishery, is about six miles east of Black River. Only twelve pounds are set here in water from twenty to forty feet deep, the inner pounds being about seventy rods from shore, the outer about one and one-fourth miles. The bottom is sandy and the "holding ground" very good. Passing easterly we find the next stations between Chagrin River, near Willoughby, and Grand River, near Painesville. Thirteen nets were used here in 1879. The only other station in this section is situated about three miles east of the mouth of Grand River, where there are four nets. The bottom, as at other points along this shore, is sandy and gravelly.

Between Ashtabula and Conneaut we find important gill-net grounds extending twenty-five miles from shore. In spring the fishermen do not go farther than twelve miles from shore, but in summer they go to the outer limit of the ground, about twenty-five miles distant. Large quantities of whitefish and blue pike are taken on these grounds. The fishermen are well acquainted with the migrations of the different species and follow them from shoal into deep water and *vice versa*.

There are two seining reaches at the mouth of Conneaut Harbor, which are visited for a short time in the spring and in some years a few days in autumn.

CONNEAUT TO BUFFALO.—The fishing-grounds of Erie extend from about eight miles west of the "Head" to the western part of the peninsula encircling Erie Bay and pass in a northeasterly direction, the distance from shore varying from four to fifteen miles according to the season. The greater portion of the fishing is prosecuted in from twelve to eighteen fathoms of water. In the spring the fish come from the westward and the grounds earliest visited are west of the "Head," but the best fishing is always north-northeast of the mouth of the harbor and about ten miles out. No considerable quantity of whitefish is taken within four miles of shore. The abundance of fish on the Erie grounds is thought to be increasing. The largest quantities of whitefish are taken in June and July and in the fall about the middle of October. Later than this, quantities of pike are

taken in small-mesh nets, set three or four miles from shore. Pound-nets are not allowed nearer shore than three miles, so that all fishing is done with gill-nets and hooks.

Many years ago Barcelona was the most important fishing town on Lake Erie, but at present the grounds are almost entirely depleted. The grounds at Dunkirk were also famous for a long time, but very little fishing is prosecuted in that locality at present.

23. LAKE ONTARIO.

There are no important fishing-grounds on the south shore of Lake Ontario between the Niagara River and Port Ontario, and very little fishing is carried on along this shore. The only important grounds are located at the east end of the lake and on the north shore within Canadian limits. There are small and unimportant gill-net grounds at Poultneyville, Fairhaven, Oak Orchard, Wilson, Braddock's Bay, Charlotte, and Cole's Landing, near Oswego, where a limited amount of fishing is carried on, the products of which are principally for local consumption. A few small seines are also employed along this stretch of coast for the same purpose.

At Port Ontario the seining-grounds begin a mile and a half north of Salmon River and extend along the shore towards Sturgeon Point, a distance of about six miles. Outside are located the gill-net grounds, the nets being in from sixty to two hundred feet of water, and from one and a quarter to seven miles from land.

Near Cape Vincent one pound is located, set in about twenty feet of water, and at Bear Point there are two in eighteen feet.

Along the entire shore from Port Ontario to Amherst Island, there are numerous gill-net grounds, famous localities being about the Duck Islands and Torch Islands, Long and Bear Points.

This whole stretch of shore also furnishes suitable grounds for traps and fykes, some localities being particularly suited for bull-head fishing. Southwest of Point Peninsula there is a famous white-fish ground. Traps and fykes are set along the Saint Lawrence River, on the American side, for a considerable distance.

Sacket's Harbor grounds are situated about Black River Bay, Chaumont Bay, and in the lake off Grenadier and Fox Islands, Stony Point, etc. The principal fishery, however, is located at Duck Island, in Canadian waters. These grounds are considered the most profitable on the entire lake.

E.—THE GEOGRAPHICAL DISTRIBUTION OF FRESH- WATER FOOD-FISHES IN THE SEVERAL HYDRO- GRAPHIC BASINS OF THE UNITED STATES.

BY DAVID S. JORDAN.

The following collection of partial faunal lists has been prepared for the purpose of indicating the number of species of fishes suitable for food occurring in the several hydrographic basins of the United States.

GEOGRAPHICAL LISTS OF THE INLAND FOOD-FISHES OF THE UNITED STATES.

24. THE GREAT LAKES.

<i>Lota maculosa</i> . Lawyer.	<i>Coregonus Hoyi</i> . Cisco.
<i>Haploidonotus grunniens</i> . Sheep's-head.	<i>Coregonus nigripinnis</i> . Blue-fin.
<i>Percina caprodes</i> .	<i>Coregonus tullibee</i> .
<i>Perca americana</i> . Yellow Perch. Perch.	<i>Thymallus tricolor</i> . Grayling.
<i>Stizostedion canadense</i> . Wall-eyed Pike.	<i>Salvelinus namaycush</i> . Lake Trout. Mackinaw
<i>Stizostedion vitreum</i> . Sauger.	Trout.
<i>Roccus chrysops</i> . White Bass.	<i>Salvelinus siscowet</i> . Siscowet.
<i>Micropterus salmoides</i> . Black Bass.	<i>Salvelinus fontinalis</i> . Brook Trout.
<i>Micropterus dolomieu</i> . Small-mouth Black	<i>Hyodon tergisus</i> . Moon-eye.
Bass.	<i>Clupea vernalis</i> . Saw Belly.
<i>Pomoxys sparoides</i> . Bar-fish.	<i>Semotilus corporalis</i> .
<i>Ambloplites rupestris</i> . Rock Bass.	<i>Nocomis biguttatus</i> .
<i>Chænobryttus antistius</i> .	<i>Notemigonus chrysoleucus</i> .
<i>Lepomis cyanellus</i> .	<i>Notropis megalops</i> . Shiner.
<i>Lepomis pallidus</i> .	<i>Moxostoma carpio</i> .
<i>Lepomis megalotis</i> .	<i>Moxostoma macrolepidotum</i> . Red Horse.
<i>Lepomis gibbosus</i> . Common Sunfish.	<i>Moxostoma aureolum</i> . Mullet Sucker.
<i>Esox nobilior</i> . Muskellunge.	<i>Moxostoma anisura</i> .
<i>Esox lucius</i> . Pike.	<i>Moxostoma velatum</i> .
<i>Esox vermiculatus</i> .	<i>Minytrema melanops</i> .
<i>Percopsis guttatus</i> .	<i>Erimyzon sucetta</i> . Creek-fish.
<i>Coregonus quadrilateralis</i> . Menomonee White-	<i>Catostomus teres</i> . Common Sucker.
fish.	<i>Catostomus catostomus</i> . Long-snouted Sucker.
<i>Coregonus labradoricus</i> .	<i>Carpiodes cyprinus</i> . Carp Sucker.
<i>Coregonus clupeiformis</i> . Whitefish.	<i>Ictalurus punctatus</i> . Channel Cat.
<i>Coregonus Artedi</i> . Lake Herring. Cisco.	<i>Amiurus nigricans</i> . Great Lake Catfish.

Amiurus natalis.
Amiurus vulgaris.
Amiurus nebulosus. Bull-head Catfish.
Amiurus melas. Bull-head.
Noturus flavus.

Anguilla rostrata. Eel.
Amia calva. Dogfish.
Lepidosteus platystomus. Gar Pike.
Lepidosteus osseus. Billfish. Gar Pike.
Acipenser rubicundus. Sturgeon.

25. THE LAKES OF MAINE.

Lota maculosa. Eel-pout.
Perca americana. Perch.
Lepomis auritus.
Lepomis gibbosus.
Coregonus labradoricus.
Salvelinus namaycush. Togue. Lunge.

Salvelinus quassa. Blue-back Trout.
Notropis megalops.
Erimyzon sucetta.
Catostomus teres.
Amiurus nebulosus.

26. THE CONNECTICUT RIVER BASIN

Lota maculosa. Eel-pout.
Perca americana. Perch.
Lepomis auritus. Sunfish.
Lepomis gibbosus. Sunfish. Roach.
Esox reticulatus. Pickerel.
Esox americanus. Pickerel.
Salvelinus fontinalis. Trout.

Semotilus bullaris. Chub.
Notemigonus chryssoleucus. Shiner.
Notropis megalops. Dace.
Erimyzon sucetta. Sucker.
Catostomus teres. Sucker.
Amiurus catus. Bull-head.
Anguilla rostrata. Eel.

27. THE HUDSON RIVER BASIN.

Perca americana. Perch.
Lepomis auritus. Sunfish.
Lepomis gibbosus. Pumpkin Seed. Sunfish.
 Roach.
Esox reticulatus. Pickerel.
Esox americanus. Brook Pickerel.
Salvelinus fontinalis. Trout.
Exoglossum maxillingua.
Semotilus corporalis. Dace. Horned Dace.

Semotilus bullaris. Dace. Horned Dace.
Notemigonus chryssoleucus. Shiner.
Notropis megalops. Horned Dace.
Erimyzon sucetta. Sucker.
Catostomus teres. Sucker.
Amiurus catus. Bull-head.
Anguilla rostrata. Eel.
Acipenser oxyrhynchus. Sturgeon.

28. THE DELAWARE RIVER BASIN.

Perca americana. Perch.
Roccus lineatus. Rockfish.
Roccus americanus. White Perch.
Mesogonistius chætodon. Banded Sunfish.
Enneacanthus obesus. Spotted Sunfish.
Enneacanthus simulans.
Pomoxys sparoides. Goggle-eyed Perch.
Acantharchus pomotis. Mud Sunfish.
Lepomis auritus. River Sunfish. Ruddy
 Rudder. Black-eared Sunfish.
Lepomis pallidus. Blue Sunfish.
Lepomis gibbosus. Sunfish.
Micropterus Dolomieii. Black Bass.

Esox reticulatus. Pike.
Esox americanus. Ditch Pike.
Salvelinus fontinalis. Trout.
Semotilus corporalis. Chub.
Semotilus bullaris. Chub.
Notemigonus chryssoleucus. Roach.
Notropis megalops. Redfin.
Erimyzon sucetta. Mullet.
Catostomus teres. Sucker.
Amiurus albidus.
Amiurus nebulosus. Catfish.
Anguilla rostrata. Eel.
Lepidosteus osseus. Gar Pike.

29. THE SUSQUEHANNA RIVER BASIN.

<i>Percina caprodes</i> .	<i>Notropis megalops</i> .
<i>Perca americana</i> . Perch.	<i>Exoglossum maxillingua</i> . Cut-lips.
<i>Lepomis auritus</i> . Pumpkin Seed.	<i>Erimyzon sucetta</i> . Sucker.
<i>Lepomis gibbosus</i> . Pumpkin Seed.	<i>Catostomus nigricans</i> .
<i>Esox reticulatus</i> . Pike.	<i>Catostomus teres</i> .
<i>Esox americanus</i> . Pickerel.	<i>Carpionodes cyprinus</i> .
<i>Salvelinus fontinalis</i> . Trout.	<i>Amiurus albidus</i> . Catfish.
<i>Semotilus corporalis</i> . Chub.	<i>Amiurus lophius</i> . Catfish.
<i>Semotilus bullaris</i> . Fall-fish.	<i>Amiurus nebulosus</i> . Catfish.
<i>Nocomis biguttatus</i> . Horned Dace.	<i>Anguilla rostrata</i> . Eel.
<i>Notemigonus chrysoleucus</i> . Shiner.	<i>Lepidosteus osseus</i> . Gar.

30. THE POTOMAC RIVER BASIN.

<i>Percina caprodes</i> .	<i>Nocomis biguttatus</i> .
<i>Perca americana</i> . Perch.	<i>Notemigonus chrysoleucus</i> . Shiner.
<i>Pomoxys sparoides</i> .	<i>Notropis megalops</i> .
<i>Lepomis auritus</i> . Bream.	<i>Moxostoma macrolepidotum</i> . Mullet Sucker.
<i>Lepomis gibbosus</i> .	<i>Erimyzon sucetta</i> .
<i>Esox reticulatus</i> . Pike.	<i>Catostomus nigricans</i> .
<i>Esox americanus</i> . Pickerel.	<i>Catostomus teres</i> .
<i>Salvelinus fontinalis</i> . Trout.	<i>Amiurus albidus</i> . Catfish.
<i>Dorosoma Cepedianum</i> . Mud Shad.	<i>Amiurus catus</i> . Catfish.
<i>Carassius auratus</i> . Gold-fish.	<i>Amiurus lophius</i> . Catfish.
<i>Semotilus corporalis</i> .	<i>Anguilla rostrata</i> . Eel.
<i>Semotilus bullaris</i> .	<i>Lepidosteus osseus</i> . Gar Pike.

31. THE NEUSE RIVER BASIN.

<i>Perca americana</i> .	<i>Notemigonus americanus</i> .
<i>Micropterus salmoides</i> . Chub.	<i>Notropis megalops</i> .
<i>Centrarchus macropterus</i> .	<i>Moxostoma macrolepidotum</i> .
<i>Pomoxys sparoides</i> .	<i>Moxostoma crassilabre</i> .
<i>Pomoxys annularis</i> .	<i>Moxostoma cervinum</i> . Jump Rocks.
<i>Ambloplites rupestris</i> .	<i>Moxostoma album</i> .
<i>Chænobryttus gulosus</i> .	<i>Moxostoma velatum</i> .
<i>Acantharchus pomotis</i> .	<i>Moxostoma papillosum</i> .
<i>Lepomis auritus</i> .	<i>Erimyzon sucetta</i> .
<i>Lepomis gibbosus</i> .	<i>Catostomus teres</i> .
<i>Esox reticulatus</i> .	<i>Amiurus niveiventris</i> .
<i>Esox americanus</i> .	<i>Amiurus natalis</i> .
<i>Salvelinus fontinalis</i> . Trout.	<i>Amiurus nebulosus</i> .
<i>Dorosoma Cepedianum</i> .	<i>Amiurus platycephalus</i> .
<i>Semotilus corporalis</i> .	<i>Anguilla rostrata</i> . Eel.
<i>Nocomis biguttatus</i> .	<i>Amia calva</i> . Grindle.

32. THE SANTEE RIVER BASIN.

<i>Micropterus salmoides</i> .	<i>Moxostoma cervinum</i> .
<i>Centrarchus macropterus</i> .	<i>Moxostoma album</i> .
<i>Pomoxys sparoides</i> .	<i>Moxostoma velatum</i> .
<i>Chænobryttus gulosus</i> .	<i>Moxostoma coregonus</i> .
<i>Lepomis auritus</i> .	<i>Moxostoma papillosum</i> .
<i>Lepomis pallidus</i> .	<i>Minytrema melanops</i> .
<i>Lepomis gibbosus</i> .	<i>Erimyzon sucetta</i> .
<i>Esox reticulatus</i> .	<i>Catostomus teres</i> .
<i>Esox americanus</i> .	<i>Amiurus platycephalus</i> .
<i>Salvelinus fontinalis</i> .	<i>Amiurus brunneus</i> .
<i>Dorosoma Cepedianum</i> .	<i>Anguilla rostrata</i> .
<i>Semotilus corporalis</i> .	<i>Amia calva</i> .
<i>Nocomis biguttatus</i> .	<i>Lepidosteus osseus</i> .
<i>Notemigonus americanus</i> .	

33. THE SAVANNAH RIVER BASIN.

<i>Micropterus salmoides</i> .	<i>Semotilus corporalis</i> .
<i>Micropterus Dolomieii</i> .	<i>Notemigonus americanus</i> .
<i>Centrarchus macropterus</i> .	<i>Moxostoma cervinum</i> .
<i>Pomoxys sparoides</i> .	<i>Moxostoma papillosum</i> .
<i>Chænobryttus gulosus</i> .	<i>Catostomus nigricans</i> .
<i>Lepomis auritus</i> .	<i>Catostomus teres</i> .
<i>Lepomis pallidus</i> .	<i>Ictalurus punctatus</i> .
<i>Lepomis megalotis</i> .	<i>Amiurus brunneus</i> .
<i>Lepomis gibbosus</i> .	<i>Anguilla rostrata</i> .
<i>Esox reticulatus</i> .	<i>Amia calva</i> .
<i>Dorosoma Cepedianum</i> .	<i>Lepidosteus osseus</i> .

34. THE SAINT JOHN'S RIVER BASIN.

<i>Micropterus salmoides</i> . Trout.	<i>Dorosoma Cepedianum</i> . Stink Shad.
<i>Centrarchus macropterus</i> .	<i>Notemigonus americanus</i> . Silver-fish.
<i>Pomoxys sparoides</i> . Speckled Perch.	<i>Erimyzon Goodei</i> . Sucker (Goode's Sucker).
<i>Chænobryttus gulosus</i> . Warmouth Perch.	<i>Ictalurus punctatus</i> . Channel Cat. Small-mouth Cat.
<i>Lepomis punctatus</i> . Chinquapin Perch.	<i>Amiurus nigricans</i> .
<i>Lepomis auritus</i> . Red-bellied Perch.	<i>Amiurus niveiventris</i> .
<i>Lepomis pallidus</i> . Copperhead Bream.	<i>Amiurus marmoratus</i> .
<i>Lepomis Holbrookii</i> .	<i>Amiurus erebennus</i> . Speckled Cat (Goode's Cat).
<i>Lepomis gibbosus</i> . Bream.	<i>Anguilla rostrata</i> . Eel.
<i>Esox reticulatus</i> . Jack.	<i>Amia calva</i> . Mudfish.
<i>Lepidosteus ossens</i> . Gar Pike.	

Many sea fish run up the river far above brackish water.

35. THE CHATTAHOOCHEE RIVER BASIN.

<i>Micropterus salmoides</i> .	<i>Clupea chrysochloris</i> .
<i>Micropterus Dolomiei</i> .	<i>Dorosoma Cepedianum</i> .
<i>Centrarchus macropterus</i> .	<i>Nocomis biguttatus</i> .
<i>Pomoxys sparoides</i> .	<i>Moxostoma macrolepidotum</i> .
<i>Ambloplites rupestris</i> .	<i>Moxostoma cervinum</i> .
<i>Chænobryttus gulosus</i> .	<i>Ictalurus punctatus</i> .
<i>Lepomis pallidus</i> .	<i>Amiurus brunneus</i> .
<i>Lepomis megalotis</i> .	<i>Anguilla rostrata</i> .
<i>Esox reticulatus</i> .	<i>Amia calva</i> .
<i>Salvelinus fontinalis</i> .	<i>Lepidosteus osseus</i> .
<i>Hyodon selenops</i> .	

36. THE ALABAMA RIVER BASIN.

<i>Haploidonotus grunniens</i> . Drum.	<i>Notemigonus chrysoleucus</i> .
<i>Percina caprodes</i> .	<i>Notropis megalops</i> .
<i>Stizostedion vitreum</i> .	<i>Moxostoma macrolepidotum</i> .
<i>Micropterus salmoides</i> . "Trout."	<i>Moxostoma pœcilura</i> .
<i>Micropterus Dolomiei</i> .	<i>Minytrema melanops</i> .
<i>Centrarchus macropterus</i> .	<i>Erimyzon sucetta</i> .
<i>Pomoxys sparoides</i> .	<i>Catostomus nigricans</i> .
<i>Pomoxys annularis</i> .	<i>Catostomus teres</i> .
<i>Ambloplites rupestris</i> .	<i>Cycleptus elongatus</i> .
<i>Chænobryttus gulosus</i> .	<i>Ictiobus cyprinella</i> .
<i>Lepomis auritus</i> .	<i>Ictiobus urus</i> .
<i>Lepomis pallidus</i> .	<i>Ictiobus bubalus</i> .
<i>Lepomis megalotis</i> .	<i>Ictalurus punctatus</i> .
<i>Lepomis notatus</i> .	<i>Amiurus natalis</i> .
<i>Esox reticulatus</i> .	<i>Anguilla rostrata</i> .
<i>Clupea chrysochloris</i> .	<i>Amia calva</i> .
<i>Dorosoma Cepedianum</i> .	<i>Lepidosteus platystomus</i> .
<i>Hyodon selenops</i> .	<i>Lepidosteus osseus</i> .
<i>Nocomis biguttatus</i> .	

37. THE MISSISSIPPI RIVER BASIN.

a. THE LOWER MISSISSIPPI.

<i>Haploidonotus grunniens</i> . Gaspergou.	<i>Ambloplites rupestris</i> .
<i>Percina caprodes</i> .	<i>Chænobryttus gulosus</i> . Warmouth.
<i>Stizostedion vitreum</i> . "Salmon."	<i>Lepomis cyanellus</i> .
<i>Roccus chrysops</i> . White Bass.	<i>Lepomis symmetricus</i> .
<i>Roccus interruptus</i> . Yellow Bass.	<i>Lepomis auritus</i> .
<i>Micropterus salmoides</i> .	<i>Lepomis pallidus</i> .
<i>Micropterus Dolomiei</i> .	<i>Lepomis megalotis</i> .
<i>Centrarchus macropterus</i> .	<i>Lepomis notatus</i> .
<i>Pomoxys sparoides</i> .	<i>Lepomis miniatus</i> .
<i>Pomoxys annularis</i> . Crappy. Sac-a-lai.	<i>Esox vermiculatus</i> .

<i>Hyodon tergisus</i> .	<i>Ictalurus furcatus</i> .
<i>Hyodon selenops</i> .	<i>Ictalurus punctatus</i> .
<i>Clupea chrysochloris</i> .	<i>Ictalurus ponderosus</i> .
<i>Dorosoma Cepedianum</i> .	<i>Amiurus nigricans</i> .
<i>Semotilus corporalis</i> .	<i>Amiurus natalis</i> .
<i>Nocomis biguttatus</i> .	<i>Amiurus nebulosus</i> .
<i>Notemigonus chrysoleucus</i> .	<i>Amiurus marmoratus</i> .
<i>Notropis megalops</i> .	<i>Amiurus vulgaris</i> .
<i>Moxostoma macrolepidotum</i> .	<i>Amiurus melas</i> .
<i>Moxostoma pœcilura</i> .	<i>Leptops olivaris</i> .
<i>Moxostoma velatum</i> .	<i>Noturus flavus</i> .
<i>Minytrema melanops</i> .	<i>Anguilla rostrata</i> .
<i>Erimyzon sucetta</i> .	<i>Amia calva</i> . Johnny-grindle.
<i>Catostomus nigricans</i> .	<i>Lepidosteus spatula</i> . Alligator Gar.
<i>Catostomus teres</i> .	<i>Lepidosteus platystomus</i> . Duck-bill Gar.
<i>Cycleptus elongatus</i> .	<i>Lepidosteus osseus</i> . Long-nosed Gar.
<i>Ictiobus cyprinella</i> .	<i>Polyodon spathula</i> . Paddle-fish.
<i>Ictiobus urus</i> .	<i>Scaphirhynchops platyrhynchus</i> . Shovel-nose
<i>Ictiobus bubalus</i> .	Sturgeon.
<i>Carpiodes carpio</i> .	<i>Acipenser rubicundus</i> . Sturgeon.
<i>Carpiodes cyprinus</i> .	

b. THE UPPER MISSISSIPPI.

<i>Lota maculosa</i> . Ling.	<i>Percopsis guttatus</i> .
<i>Haplodonotus grunniens</i> . Sheep's-head. White	<i>Coregonus Artedi</i> . Cisco.
Perch. Black Perch. Drum.	<i>Salvelinus fontinalis</i> . Trout.
<i>Percina caprodes</i> .	<i>Hyodon alosoides</i> .
<i>Perca americana</i> . Yellow Perch. Ringed Perch.	<i>Hyodon tergisus</i> . Moon Eye. Toothed Herring.
<i>Stizostedion canadense</i> .	<i>Clupea chrysochloris</i> . Skipjack.
<i>Stizostedion vitreum</i> . Salmon. Wall-eye Pike.	<i>Clupea sapidissima</i> . Shad.
<i>Roccus chrysops</i> . White Bass.	<i>Dorosoma Cepedianum</i> . Hickory Shad. Giz-
<i>Roccus interruptus</i> . Yellow Bass.	zard Shad.
<i>Micropterus salmoides</i> . Black Bass.	<i>Semotilus corporalis</i> . Chub.
<i>Micropterus Dolomieii</i> . Black Bass.	<i>Nocomis biguttatus</i> . Horny-head.
<i>Pomoxys sparoides</i> . Calico Bass. Tin-mouth.	<i>Notemigonus chrysoleucus</i> .
<i>Pomoxys annularis</i> . Crappy.	<i>Notropis megalops</i> . Shiner.
<i>Ambloplites rupestris</i> . Goggle Eye.	<i>Quassilabia lacera</i> . Hare-lip Sucker.
<i>Chænobryttus antistius</i> . Bigmouth Sunfish.	<i>Placopharanx carinatus</i> .
<i>Lepomis cyanellus</i> .	<i>Moxostoma macrolepidotum</i> . Red Horse.
<i>Lepomis pallidus</i> . Common Sunfish.	<i>Moxostoma aureolum</i> .
<i>Lepomis megalotis</i> . Long-ear Sunfish.	<i>Moxostoma velatum</i> .
<i>Lepomis gibbosus</i> . Yellow Sunfish. Spotted	<i>Minytrema melanops</i> . Spotted Sucker.
Sunfish.	<i>Erimyzon sucetta</i> . Sweet Sucker.
<i>Esox nobilior</i> . Muskellunge.	<i>Catostomus nigricans</i> . Hog Sucker.
<i>Esox lucius</i> . Pike. Pickerel.	<i>Catostomus teres</i> . White Sucker.
<i>Esox vermiculatus</i> .	<i>Catostomus catostomus</i> .
<i>Umbra limi</i> . Bastard Dogfish.	<i>Cycleptus elongatus</i> . Missouri Sucker. Blue-fish.

<i>Carpiodes cyprinus</i> .	Spear Back.	Quill Back.	<i>Amiurus nigricans</i> .	Mississippi Cat.	Blue-Cat.	
<i>Carpiodes carpio</i> .	White Carp.	Carp Sucker.		Fulton Cat.		
<i>Ictiobus bubalus</i> .	Stub Nose.	Sucker Mouth.	<i>Amiurus melas</i> .			
	River Buffalo.	Black Carp.	Slough Buffalo.	<i>Leptopsolivaris</i> .	Yellow Cat. Goujon. Bashaw.	
	Buffalo fish.			<i>Noturus flavus</i> .	Stone Cat.	
<i>Ictiobus urus</i> .	Stub Nose.	Sucker Mouth.	River	<i>Anguilla rostrata</i> .	Eel.	
	Buffalo.	Black Carp.	Slough Buffalo.	Mon-	<i>Amia calva</i> .	Dogfish.
	grel Buffalo.			<i>Lepidosteus spatula</i> .	Alligator Gar.	Duck
<i>Ictiobus cyprinella</i> .	Stub Nose.	Sucker Mouth.		Bill.		
	River Buffalo.	Black Carp.	Slough Buffalo.	<i>Lepidosteus platystomus</i> .	Short-nose Gar.	
	Red-mouth Buffalo.			<i>Lepidosteus osseus</i> .	Long-nose Gar.	Billy
<i>Ictalurus furcatus</i> .	Chuckle-head Cat.			Gar.		
<i>Ictalurus punctatus</i> .	Channel Cat.			<i>Polyodon spatula</i> .	Spoon Bill.	Paddle-fish.
<i>Amiurus ponderosus</i> .	Big Cat.				Duck-bill Cat.	
<i>Amiurus natalis</i> .				<i>Scaphirhynchops platyrhynchus</i> .	White Stur-	
<i>Amiurus vulgaris</i> .				geon.	Shovel-nose Sturgeon.	
<i>Amiurus nebulosus</i> .	Cat-fish.	Eastern Bull-	<i>Acipenser rubicundus</i> .	Black Sturgeon.	Stone	
	pout. Bullpout.			Sturgeon.		

c. THE OHIO RIVER.

<i>Haploidonotus grunniens</i> .			<i>Nocomis biguttatus</i> .	Horned Chub.
<i>Percina caprodes</i> .			<i>Notemigonus chrysoleucus</i> .	
<i>Stizostedion canadense</i> .			<i>Notropis megalops</i> .	
<i>Stizostedion vitreum</i> .	Black Salmon.	White	<i>Quassilabia lacera</i> .	
	Salmon.		<i>Placopharanx carinatus</i> .	
<i>Roccus chrysops</i> .	White Bass.	Bachelor	<i>Moxostoma carpio</i> .	Red Horse.
	Perch.		<i>Moxostoma macrolepidotum</i> .	Red Horse.
<i>Micropterus salmoides</i> .	Black Bass.	Green	<i>Moxostoma aureolum</i> .	Mullet.
	Bass.		<i>Moxostoma anisura</i> .	
<i>Micropterus Dolomiei</i> .	Black Bass.		<i>Moxostoma velatum</i> .	
<i>Pomoxys sparoides</i> .			<i>Minytrema melanops</i> .	
<i>Pomoxys annularis</i> .			<i>Erinyzon sucetta</i> .	Sucker.
<i>Ambloplites rupestris</i> .	Rock Bass.	Goggle	<i>Catostomus nigricans</i> .	Sucker.
	Eye. Red eye.		<i>Catostomus teres</i> .	Sucker.
<i>Lepomis cyanellus</i> .	Sunfish.		<i>Cycleptus elongatus</i> .	Missouri Sucker. Gourd-
<i>Lepomis pallidus</i> .	Sunfish.			seed Sucker.
<i>Lepomis megalotis</i> .	Sunfish.		<i>Carpiodes cyprinus</i> .	Carp Sucker. Quill-back.
<i>Esox vermiculatus</i> .			<i>Carpiodes carpio</i> .	Carp Sucker.
<i>Salvelinus fontinalis</i> .			<i>Ictiobus cyprinella</i> .	Red-mouth Buffalo.
<i>Hyodon alosoides</i> .			<i>Ictiobus urus</i> .	Mongrel Buffalo.
<i>Hyodon tergisus</i> .	Tooth Herring.		<i>Ictiobus bubalus</i> .	Buffalo.
<i>Clupea sapidissima</i> .	Sea Shad.	Potomac Shad.	<i>Ictalurus furcatus</i> .	
<i>Clupea chrysochloris</i> .	Skipjack.	Ohio Her-	<i>Ictalurus punctatus</i> .	Blue or Channel Cat.
	ring.		<i>Amiurus nigricans</i> .	Mississippi Cat.
<i>Dorosoma Cepedianum</i> .	Hickory Sha.		<i>Amiurus natalis</i> .	Yellow Cat.
<i>Semotilus corporalis</i> .	Chub.	Silversides.	<i>Amiurus nebulosus</i> .	Bull-head Cat.

Amiurus xanthocephalus.
Amiurus melas.
Leptops olivaris. Mud Cat.
Noturus flavus.
Anguilla rostrata. Black Eel. Yellow Eel.
Amia calva.

Lepidosteus platystomus. Short-nose Gar-fish.
Lepidosteus osseus. Gar Pike.
Polyodon spatula. Spoon-bill Cat.
Scaphirhynchops platyrhynchus. Shovel-nose Sturgeon.
Acipenser rubicundus. Red Sturgeon.

d. THE MISSOURI RIVER.

Lota maculosa.
Haploidonotus grunniens.
Percina caprodes.
Stizostedion canadense.
Stizostedion vitreum.
Roccus chrysops.
Micropterus salmoides.
Micropterus Dolomiei.
Pomoxys sparoides.
Pomoxys annularis.
Ambloplites rupestris.
Lepomis cyanellus.
Lepomis pallidus.
Lepomis megalotis.
Esox lucius.
Percopsis guttatus.
Thymallus tricolor.
Salmo purpuratus.
Hyodon alosoides.
Hyodon tergisus.
Dorosoma Cepedianum.
Semotilus corporalis.
Platygobio gracilis.
Nocomis biguttatus.
Notemigonus chrysoleucus.
Notropis megalops.

Moxostoma macrolepidotum.
Moxostoma aureolum.
Minytrema melanops.
Erimyzon sucetta.
Catostomus nigricans.
Catostomus teres.
Catostomus retropinnis.
Catostomus catostomus.
Cycleptus elongatus.
Carpionodes cyprinus.
Ictiobus cyprinella.
Ictiobus urus.
Ictiobus bubalus.
Ictalurus punctatus.
Amiurus nigricans.
Amiurus natalis.
Amiurus melas.
Leptops olivaris.
Noturus flavus.
Anguilla rostrata.
Amia calva.
Lepidosteus platystomus.
Lepidosteus osseus.
Polyodon spatula.
Scaphirhynchops platyrhynchus.
Acipenser rubicundus.

38. THE RIO GRANDE BASIN.

Haploidonotus grunniens.
Percina caprodes.
Micropterus salmoides.
Lepomis cyanellus.
Lepomis pallidus.
Lepomis megalotis.
Salmo spilurus.
Dorosoma Cepedianum.
Notemigonus chrysoleucus.
Squalius atrarius.
Squalius pandora.
Moxostoma albidum.

Minytrema melanops.
Erimyzon sucetta.
Pantosteus generosus.
Carpionodes cyprinus.
Ictalurus furcatus.
Ictalurus punctatus.
Amiurus lupus.
Amiurus natalis.
Anguilla rostrata.
Lepidosteus osseus.
Scaphirhynchops platyrhynchus.

39. THE COLORADO RIVER BASIN.

Salmo purpuratus.
Salmo spilurus.
Platygobio gracilis.
Squalius atrarius.
Squalius niger.
Gila robusta.
Gila Grahmi.
Gila elegans.

Ptychochilus lucius.
Moxostoma macrolepidotum.
Catostomus Clarki.
Catostomus insignis.
Catostomus cypho.
Catostomus latipinnis.
Catostomus discobolus.
Pantosteus generosus.

40. THE SACRAMENTO RIVER BASIN.

Archoplites interruptus.
Hysterocephalus Traski.
Salmo irideus.
Salmo Gairdneri.
Salvelinus malma.
Mylopharodon conocephalus.
Mylochilus caurinus.

Pogonichthys macrolepidotus.
Squalius gibbosus.
Ptychochilus oregonensis.
Ptychochilus Harfordi.
Lavinia exilicauda.
Orthodon microlepidotus.
Catostomus occidentalis.

41. THE COLUMBIA RIVER BASIN.

Coregonus Williamsoni.
Salmo Gairdneri.
Salmo purpuratus.
Salvelinus malma.
Mylochilus caurinus.

Richardsonius balteatus.
Ptychochilus oregonensis.
Acrochilus alutaceus.
Catostomus macrochilus.
Catostomus discobolus.

42. THE SALT LAKE BASIN.

Coregonus Williamsoni.
Salmo purpuratus.
Salmo spilurus.
Platygobio gracilis.
Squalius atrarius.

Squalius rhomaleus.
Chasmistes liorus.
Catostomus fecundus.
Catostomus ardens.
Pantosteus generosus.

43. TABLE SHOWING THE GEOGRAPHICAL DISTRIBUTION OF THE RIVER FOOD-FISHES.

	The Great Lakes.	The lakes of Maine.	Connecticut.	Hudson.	Delaware.	Susquehanna.	Potomac.	Neuse.	Santee.	Savannah.	Saint John's	Chattahoochee.	Alabama.	Lower Mississippi.	Rio Grande.	Ohio.	Upper Mississippi.	Missouri.	Salt Lake Basin.	Colorado.	Sacramento.	Columbia.
<i>Lota maculosa</i>	x		x													x	x	x				
<i>Haploidonotus grunniens</i>	x												x	x	x	x	x	x				
<i>Percina caprodes</i>	x					x	x						x	x	x	x	x	x				
<i>Perca americana</i>	x	x	x	x	x	x	x	x									x					
<i>Stizostedion canadense</i>	x															x	x	x				
" <i>vitreum</i>	x												x	x		x	x	x				
<i>Roccus chrysops</i>	x													x		x	x	x				
" <i>interruptus</i>														x			x					

Table showing the geographical distribution of the river food-fishes—Continued.

	The Great Lakes.	The lakes of Maine.	Connecticut.	Hudson.	Delaware.	Susquehanna.	Potomac.	Nense.	Santee.	Savannah.	Saint John's.	Chattahoochee.	Alabama.	Lower Mississippi.	Rio Grande.	Ohio.	Upper Mississippi.	Missouri.	Salt Lake Basin.	Colorado.	Sacramento.	Columbia.
<i>Micropterus salmoides</i>	x							x	x	x	x	x	x	x	x	x	x	x				
“ <i>Dolomieu</i>	x																					
<i>Centrarchus macropterus</i>								x	x	x	x	x	x	x			x	x				
<i>Pomoxys sparoides</i>	x				x		x	x	x	x	x	x	x	x		x	x	x				
“ <i>annularis</i>								x					x			x	x	x				
<i>Archoplites interruptus</i>																					x	
<i>Ambloplites rupestris</i>	x							x				x	x	x		x	x	x				
<i>Chenobryttus gulosus</i>								x	x	x	x	x	x	x								
“ <i>antistius</i>	x																x					
<i>Acantharchus pomotis</i>					x			x														
<i>Lepomis cyanellus</i>	x													x	x	x	x	x				
“ <i>punctatus</i>											x			x								
“ <i>miniatus</i>														x								
“ <i>auritus</i>		x	x	x	x	x	x	x	x	x	x	x	x	x								
“ <i>pallidus</i>	x				x				x	x	x	x	x	x	x	x	x	x				
“ <i>megalotis</i>	x									x		x	x	x	x	x	x	x				
“ <i>Holbrooki</i>											x											
“ <i>notatus</i>													x	x								
“ <i>gibbosus</i>	x	x	x	x	x	x	x	x	x	x	x						x					
<i>Hysterocarpus Traski</i>																					x	
<i>Esox nobilior</i>	x																x					
“ <i>lucius</i>	x																	x				
“ <i>reticulatus</i>			x	x	x	x	x	x	x	x	x	x	x									
“ <i>vermiculatus</i>	x													x		x	x	x				
“ <i>americanus</i>			x	x	x	x	x	x	x							x	x	x				
<i>Percopsis guttatus</i>	x																x	x				
<i>Coregonus quadrilateralis</i>	x	x																				
“ <i>labradoricus</i>	x	x																				
“ <i>clupeiformis</i>	x																					
“ <i>Williamsoni</i>																			x			x
“ <i>Arctedi</i>	x																x					
“ <i>Hoyi</i>	x																					
“ <i>nigripinnis</i>	x																					
“ <i>tulibee</i>	x																					
<i>Thymallus tricolor</i>	x																	x				
<i>Salmo irideus</i>																					x	x
“ <i>Gairdneri</i>																					x	x
“ <i>purpuratus</i>																		x	x	x		
“ <i>spilurus</i>															x				x	x		
<i>Salvelinus namaycush</i>	x	x																				
“ <i>siscowet</i>	x																					
“ <i>malma</i>																					x	x
“ <i>fontinalis</i>	x	x	x	x	x	x	x	x	x			x				x	x					
“ <i>ogassa</i>		x																				
<i>Hyodon alosoides</i>																						
“ <i>tergisus</i>	x													x		x	x	x				
“ <i>selenops</i>												x		x		x	x	x				
<i>Clupea chrysochloris</i>													x	x		x	x					
<i>Dorosoma Cepedianum</i>	x						x	x	x	x	x	x	x	x	x	x	x	x				
<i>Mylopharodon conocephalus</i>																					x	
<i>Mylochilus caurinus</i>																					x	x
<i>Pogonichthys macrolepidotus</i>																					x	
<i>Semotilus corporalis</i>	x			x	x	x	x	x	x	x			x	x		x	x	x				
“ <i>bullaris</i>			x	x	x	x	x									x	x	x				
<i>Platygnathus gracilis</i>																			x	x		
<i>Nocomis biguttatus</i>	x					x	x	x	x			x	x	x		x	x	x				
<i>Richardsonius balteatus</i>																						
<i>Notemigonus chrysolenus</i>	x		x	x	x	x	x						x	x	x	x	x	x				x

Table showing the geographical distribution of the river food-fishes—Continued.

	The Great Lakes.	The lakes of Maine.	Connecticut.	Hudson.	Delaware.	Susquehanna.	Potomac.	Neuse.	Santee.	Savannah.	Saint John's.	Chattahoochee.	Alabama.	Lower Mississippi.	Rio Grande.	Ohio.	Upper Mississippi.	Missouri.	Salt Lake Basin.	Colorado.	Sacramento.	Columbia.
<i>Notemigonus americanus</i>								x	x	x	x											
<i>Squalius gibbosus</i>																						
<i>atrarius</i>																			x			
<i>rhomaleus</i>																			x			
<i>niger</i>																				x		
<i>pandora</i>															x						x	
<i>Gila robusta</i>																				x		
<i>Grahami</i>																				x		
<i>elegans</i>																				x		
<i>Pychochilus oregonensis</i>																				x		x
<i>Harfordi</i>																				x		
<i>lucius</i>																				x		
<i>Notropis megalops</i>	x	x	x	x	x	x	x	x					x	x		x	x	x				
<i>Notropis Storerianus</i>	x																					
<i>Exoglossum maxillingua</i>				x			x															
<i>Lavinia exilicanda</i>																					x	
<i>Orthodon miorolepidotus</i>																					x	
<i>Acrochilus alutaceus</i>																x	x					x
<i>Quassilabia lacera</i>																x	x					
<i>Placopharanx carinatus</i>																x	x					
<i>Moxostoma carpio</i>	x															x	x	x				
<i>macrolepidotum</i>	x						x	x				x	x	x		x	x	x		x		
<i>aureolum</i>	x															x	x					
<i>crassilabre</i>														x	x							
<i>anisura</i>																x						
<i>pæcilura</i>													x	x								
<i>albidum</i>															x							
<i>cervinum</i>								x	x	x												
<i>album</i>								x	x													
<i>velatum</i>	x							x	x					x		x						
<i>coregonus</i>								x	x													
<i>papillosum</i>								x	x	x									x			
<i>Minytrema melanops</i>	x								x				x	x		x	x					
<i>Erimyzon sucetta</i>	x	x	x	x	x	x	x	x	x	x			x	x	x	x	x	x				
<i>Goodei</i>									x						x							
<i>Chasmistes liorus</i>																			x			
<i>Catostomus nigricans</i>						x	x			x			x			x	x	x				
<i>Clarki</i>																				x		
<i>insignis</i>																				x		
<i>cypho</i>																				x		
<i>fecundus</i>																				x		
<i>teres</i>	x	x	x	x	x	x	x	x	x	x			x	x		x	x	x				
<i>ardens</i>																			x			
<i>macrochilus</i>																						x
<i>occidentalis</i>																					x	
<i>catostomus</i>	x																x	x				
<i>retropinnis</i>																		x				
<i>latipinnis</i>																				x		
<i>discobolus</i>																				x		x
<i>Pantosteus generosus</i>														x					x	x		
<i>Cycleptus elongatus</i>													x	x	x	x	x	x				
<i>Carpiodes cyprinus</i>	x					x									x	x	x	x				
<i>carpio</i>																x	x	x				
<i>Ictiobus bubalus</i>													x	x		x	x	x				
<i>urus</i>													x	x		x	x	x				
<i>cyprinella</i>													x	x		x	x	x				
<i>Ictalurus furcatus</i>													x	x	x	x	x	x				
<i>punctatus</i>	x									x	x	x	x	x	x	x	x	x				

Table showing the geographical distribution of the river food-fishes—Continued.

	The Great Lakes.	The lakes of Maine.	Connecticut.	Hudson.	Delaware.	Susquehanna.	Potomac.	Neuse.	Santee.	Savannah.	Saint John's.	Chattahoochee.	Alabama.	Lower Mississippi.	Rio Grande.	Ohio.	Upper Mississippi.	Missouri.	Salt Lake Basin.	Colorado.	Sacramento.	Columbia.
<i>Amiurus lupus</i>															x							
<i>niveiventris</i>					x	x	x	x			x											
<i>albidus</i>																						
<i>lophius</i>						x	x															
<i>ponderosus</i>														x			x					
<i>nigricans</i>	x										x			x		x	x	x				
<i>erebennus</i>											x											
<i>natalis</i>	x							x					x	x	x	x	x	x				
<i>vulgaris</i>	x													x			x					
<i>nebulosis</i>	x	x	x	x	x	x	x	x						x		x	x					
<i>xanthocephalus</i>																x						
<i>melas</i>	x													x		x	x	x				
<i>platycephalus</i>								x	x													
<i>brunneus</i>									x	x		x										
<i>Leptops olivaris</i>														x		x	x	x				
<i>Noturus flavus</i>	x													x		x	x	x				
<i>Anguilla rostrata</i>	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
<i>Amia calva</i>	x							x	x	x	x	x	x	x		x	x	x				
<i>Lepidosteus spatula</i>														x								
<i>platystomus</i>	x												x	x		x	x	x				
<i>osseus</i>	x				x	x	x		x	x	x	x	x	x	x	x	x	x				
<i>Polyodon spathula</i>														x		x	x	x				
<i>Scaphirhynchops platyrhynchus</i> ..														x	x	x	x	x				
<i>Acipenser rubicundus</i>	x													x		x	x	x				

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OCEAN TEMPERATURES
OF THE
EASTERN COAST OF THE UNITED STATES,
WITH
THIRTY-TWO CHARTS.

By RICHARD RATHBUN.

OCEAN TEMPERATURES OF THE EASTERN COAST OF THE UNITED STATES, FROM OBSERVATIONS MADE AT TWENTY-FOUR LIGHT-HOUSES AND LIGHT-SHIPS.

[With thirty-two charts.]

By RICHARD RATHBUN.

INTRODUCTION.

Temperature has long been recognized as having an important influence upon the general movements of fishes, and especially of those species that migrate periodically from one region to another. The salmon, shad, and alewives ascend the rivers in the spring, and at about the same time large schools of mackerel and menhaden approach the coast from the direction of the Gulf Stream, and, to some extent at least, work northward as the season advances. Cod are abundant near shore only during the colder months, while lobsters retreat into deeper water at the beginning of winter, and return again in the spring. Whatever may be the impelling power that incites these and other species to change their grounds at stated periods, whether the necessity of seeking new sources of food or more congenial waters for the purposes of breeding, it has generally been observed that their migrations coincide more or less closely with certain changes in temperature, and the latter, therefore, appears to exert a controlling or restraining influence upon their movements. Until recently, however, very little has been published respecting the precise relations of temperature to fish migrations, and the subject is but little understood.

In a history of the menhaden, published in 1879,* Mr. G. Brown Goode discusses the water temperatures taken at several stations along the Atlantic coast of the United States for a period of three years, in connection with such information as was then obtainable respecting the movements of menhaden during their spring migrations. In prefacing this subject, Mr. Goode remarks that "the date of the earliest appearance of the schools of menhaden at any given point upon the coast corresponds very closely with that of the arrival of scup, shad, bluefish, and other of the non-resident species. It depends primarily upon the temperature of the water, [and the departure of the schools] is regulated by the same causes. At the approach of settled warm weather the schools make their appearance in the coast waters. They remain in the bays and near the shores until they are warned away by the breath of coming winter. The date of their appearance is earlier in the more southern waters, and the length of their sojourn longer. It is manifestly impracticable [from the data he then possessed] to give anything but approximate dates to indicate the time of their movements. In fact, the comparison of two localities, distant apart 100 or 200 miles, would indicate very little. When wider ranges are compared there becomes perceptible a proportion in the relations of the general averages. There is always a balance in favor of earlier arrivals at the more southern localities. Thus it becomes apparent

* The Natural and Economical History of the American Menhaden, by G. Brown Goode. U. S. Commission of Fish and Fisheries. Report of the Commissioner for 1877, Appendix A, 529 pp., 31 plates. Washington, 1879.

that the first schools appear in Chesapeake Bay in March and April, on the coast of New Jersey in April and early May, and on the south coast of New England in late April and May, off Cape Ann about the middle of May, and in the Gulf of Maine about the latter part of May and the first of June. Returning, they leave Maine in late September and October; Massachusetts in October, November, and December; Long Island Sound and vicinity in November and December; Chesapeake Bay in December, and Cape Hatteras in January. Farther to the south they appear to remain more or less constantly throughout the year."

In his concluding remarks the same writer states that "these facts [which he sets forth in considerable detail] appear to indicate that under ordinary circumstances the menhaden prefers a temperature of 60° to 70° Fahrenheit. When the rising temperature of spring has passed the limit of 50° to 51°, the fish are certain to appear, and when the falling temperature of autumn reaches that point, their departure is equally sure, though a few individuals may linger in waters not congenial to them. The opposite limit seems to be marked by the line of 80° or perhaps 75°. An easterly or northerly wind, lowering temporarily the surface temperature, causes the schools to sink below the surface. The chill of night also drives them down. These conclusions are not to be regarded as final. The movements of the fish about Cape Hatteras are very puzzling, and need to be interpreted by a series of careful temperature observations."

More recently similar comparisons of water temperatures have been made by Col. Marshall McDonald with respect to the shad and river herrings or alewives,* the observations he makes use of being relatively more extensive than was the case in Mr. Goode's studies of the menhaden. His observations are restricted to the Chesapeake Bay region, with special reference to the Potomac River, and are accompanied by instructive diagrams, on which the relations of temperature to the abundance of the two species of herring and the shad are graphically represented.

His final conclusions are as follows: "The diagram showing fluctuations of water temperature in the Chesapeake Bay region furnishes very interesting and suggestive data for discussion. During the winter months the water temperatures on the ocean plateau, outside of the capes, is higher than that of Chesapeake Bay or the Potomac River. The latter part of February or early in March the temperature of the bay waters rises above that of the ocean waters outside. Coincident with this the shad make their appearance in the Chesapeake and are taken in the pounds which are set in salt-water along the shores of the bay. About the first of April the temperature of the water in the Potomac River rises above the temperature of the water in the bay. Coincident with this is the beginning of the shad season in the river. The lesson taught by the diagram is that shad do not enter our rivers to spawn until the temperature of the river waters is higher than that of the salt-water from which they come. Should the waters of either the Potomac or Susquehanna continue during the season at a lower temperature than those of the bay, we would have no run either of shad or glut herring during the season."

Our object in prefacing this introduction with the above extracts from two of the most important contributions on the subject of water temperatures in their relation to the migration of fishes, has been to give a practical illustration of the great value of such studies, which have been strangely neglected by investigators. With respect to the oceanic species, there are, of necessity, many difficulties, some of them insurmountable, in the way of obtaining observations, as permanent stations for that purpose must be located mostly on or very near the coast, while the larger schools of fishes often remain some distance from the land. River stations for observ-

* The Shad—*Clupea sapidissima*, by Marshall McDonald. The Fisheries and Fishery Industries of the United States, by George Brown Goode and a staff of associates. Section I: Natural History of Aquatic Animals, pp. 594-607, plates 214, 215. Washington, 1884. Also in Report United States Commissioner of Fish and Fisheries for 1883 (1885), p. 1034, pl. 1.

ing water temperatures conjointly with the migrations of fishes can be readily established, and excellent opportunities for good work in this direction are afforded by all the larger rivers of our country.

The practical value as well as scientific importance of investigations of this character, in their bearing upon many of our most extensive sea and inland fisheries, has been fully recognized by the U. S. Fish Commissioner, and in all the explorations carried on under his direction the observation of water temperatures has been made a conspicuous feature. Unfortunately, the field work of the Fish Commission is, necessarily, limited to a comparatively short season in each year, during which operations have, for the most part, been confined within narrow areas, changing more or less from year to year, or have been extended irregularly from place to place, dependent upon the movements of the steamers. The temperature observations made by the Commission do not, therefore, form continuous series sufficiently complete in themselves for detailed comparison with the movements of fishes during an entire season of their migrations. In order to supplement and extend this class of investigations with reference to the surface waters and surface schooling fishes, the co-operation of the U. S. Light-House Board and U. S. Signal Service was obtained, and for a number of years past continuous series of observations have been taken at some sixty stations belonging to these two services, distributed along the entire Atlantic and Gulf coasts of the United States from Eastern Maine to Southern Texas.

In this report we have given the temperature results of the light-house stations only, reserving those of the Fish Commission and Signal Service for a future one. Most of the light-house stations form a series which can well be considered apart from the others, all of the stations here included being located on exposed portions of the coast, while those of the Signal Service are mostly situated in inclosed bays or harbors. A few of the light stations are, however, in similar situations to those of the Signal Service and will be considered with them. Before describing the positions and relations of the stations, it may be best to note briefly the character of observations required for application to the problem of fish migrations.

While general temperature results are of much interest, it is evident that they are totally inadequate to explain the varying movements of fishes. The changes in temperature from day to day and from season to season must be studied in great detail in order to ascertain their precise influence in regulating the arrival, progress, and departure of the schools. If mackerel appear at an earlier date in one year than in another, is that earlier appearance accompanied by a more rapid rise in temperature? If more abundant or more widely distributed during one season than another, is it due to warmer temperatures covering a wider area than usual, or to other causes? Answers to these questions are to be sought in a better understanding of the conditions of temperature along our coast, although it cannot be denied that other subjects, such as the distribution and abundance of food, and the influence of the winds and currents, need to be considered in the same connection. In order to make this precise study of the temperatures it is necessary to establish numerous stations at successive points along the course followed by the fishes in their migrations. These stations should be located at a sufficient distance from the coast to be beyond the influence of local conditions, and at such an ideal series of observing posts the determination of the relations of temperature to fish migrations would be simply a question of time, but unfortunately it is impossible to locate many such stations, and inferior ones have to be selected to complete the series. Observations should be made continuously throughout each season of migrations for several successive years, and by this means many parallel series of records would be obtained suitable for the work of comparison.

In this report we have to do only with the surface temperature of the waters immediately

bordering the coast, considered also in their relations to the temperature of the air. The outside light stations selected for taking the observations are twenty-four in number, and represent the entire eastern coast of the United States from Southern Florida to Eastern Maine. As enumerated and described below, it will be noticed that some are light-ships anchored off the land, while others are light-houses, situated on islands or on the main coast. Those of the first class are infinitely better located for temperature purposes than either of the others. At most of the stations observations were begun as early as 1878, but prior to 1881 so many breaks occurred in the records that it has been found inexpedient to make use of any of the data relating to the first three years. This report, therefore, covers a period of only five years, from 1881 to 1885, inclusive. Although the depths at the different stations vary greatly, ranging from a few feet to 18 fathoms, it was thought advisable to have the observations cover the bottom as well as the surface waters, but the former having been entirely neglected at nearly every station, no reference is made to bottom temperatures on the following pages.

The record blanks supplied to the light-house stations call for the following observations: Depth of water where the observations are taken, at mean low tide; time of observations, which are to be made twice each day at the first high water and first low water after 7 a. m.; temperature of the water at the surface and at the bottom, and by exposing the thermometer in the open air; direction and force of the wind, and state of the sky at the time of taking the temperature observations; occurrence and duration of rain or snow; occurrence and movements of any kinds of fish, singly or in schools, especially menhaden, herring, cod, mackerel, swordfish, horse-mackerel, bluefish, &c., and also of seals or whales.

As the observations are taken at the first high water and first low water after 7 a. m., they are not made at the same time every day, but generally fall within the twelve hours following 7 a. m., or between 7 a. m. and 7 p. m. Should the time for taking the first observation come immediately after 7 a. m., the second observation would be made soon after noon. As, in some places, there is considerable difference between the temperature of the water at high tide and low tide, this method of regulating the hours of observation appeared to afford the most satisfactory means of equalizing results. As elsewhere explained, the temperature observations were limited at most stations to the surface water and the air. Observations respecting the direction and force of the wind, the state of the sky and the occurrence of rain were generally well kept, but the opportunities for observing the movements of fishes were not equally good at all stations, nor was it to be expected that a constant outlook would be maintained by volunteer observers already burdened with other and more important duties. Nevertheless many interesting and valuable records were made in that line, although nothing of importance was learned respecting the regular migratory movements.

The thermometers employed were of two kinds, both of which were especially designed for taking water temperatures not only at the surface, but also in slight depths. During the first few years the stations were supplied with the excellent pattern made for the Signal Service, and kindly lent for the purpose. These thermometers are inclosed in a stout bronze case, with suitable openings for the entrance of water, and every instrument was carefully compared with a standard before being sent out. From time to time the Signal Service thermometers have been replaced by a new and equally reliable pattern, made by Charles Wilder, of Peterboro', N. H., for this special kind of work, and at present all the light-house observations are taken with these instruments. The tube is protected in a cylindrical copper case, somewhat similar in construction to that of the Signal Service, but of larger size. All instruments are compared and none having a large error are made use of. Occasionally, at some of the stations, when the regulation ther-

nometer has accidentally been broken, the observations have been continued by means of a light-house thermometer, or of one purchased at a neighboring town, pending the receipt of a new instrument, but such instances have been of rare occurrence and not likely to make any appreciable difference in the character of the records for the short periods involved.

While the light keepers have not been specially trained in the methods of taking temperature observations, their monthly returns testify to their high grade of intelligence and to their great zeal in fulfilling these additional duties without extra compensation. We are led to believe that their records contain comparatively few serious errors for which they are directly responsible, excepting in those cases which will be explained hereafter; and that, in the main, their observations have been conscientiously made and are deserving of consideration. It is also worthy of comment that so extensive an undertaking as this should have been carried on successfully at so little expense and with so little friction.

As above explained, detailed temperature observations rather than general results are essential for comparison in studying the migrations of the fishes. For that reason the reductions plotted on the accompanying charts have been made for comparatively short intervals, the entire year being divided into periods of ten days, each of which is equivalent to about one-third of a calendar month. As two observations are made daily, the mean of each ten days is derived from twenty observations, and small errors are thereby practically eliminated. Each station is represented by a chart on which the ten-day means of surface-water temperatures are given for each of the five years from 1881 to 1885, inclusive, and the air temperatures from 1881 to 1883, inclusive. The method of representing the temperatures is by curves connecting the ten-day periods, as explained on the charts. At the stations north of Cape Hatteras there were frequent indications of careless observation during exceedingly cold weather in the months of January and February, the thermometer, at times, not being read quickly enough after it had been withdrawn from the water. As such readings would manifestly afford a lower mean temperature than the actual, it has been deemed best to omit the records for those two months at the northern stations. At some of the shore stations the observations also show the effects of local influences which render them inapplicable to the open waters of the coast; but special explanation of those stations is made further on.

In addition to the charts of ten-day means, there are also seven isothermal charts on which the temperature observations at all the stations are combined, in order to afford more convenient means of comparison. Five of these charts represent the separate years from 1881 to 1885, inclusive, a sixth, the means of the same five years, and the final one, the relations of the air isotherms to the surface isotherms. The isotherms are plotted for every 5° of temperature, Fahrenheit, from 40° to 80°, inclusive. The isotherm of 35° F. occurs only at the northern stations, and there mainly in the months of January and February, the records for which have not been used. The writer has refrained from drawing any conclusions from the temperature results presented in this report, and his remarks on the following pages are mostly confined to describing the stations and indicating some of the main features with respect to the temperature curves and the isotherms. The Fahrenheit scale of temperatures has been exclusively used both in making the observations and in the construction of the charts.

The work of reducing the many observations to ten-day means and of making the original plottings of the same has been done by Miss M. J. Rathbun, while the writer is responsible for the computations for, and the plottings of, the isotherms. The charts were prepared for engraving by Mr. C. E. Gorham.

ENUMERATION AND BRIEF DESCRIPTIONS OF THE STATIONS.

The light-houses and light-ships selected as temperature stations numbered thirty-six in all, distributed at intervals along the eastern coast of the United States, from Petit Manan Island in Eastern Maine, to the Tortugas Reefs in Southern Florida. As explained before, twenty-six of these stations were located off shore, or on exposed portions of the coast, and the remainder in more or less inclosed bays, sounds, and harbors. The outside stations are alone considered in this report, and of this class the two following have been omitted, reducing the number to twenty-four. The observations were continued for so short a period at Minot's Ledge light-house, in Massachusetts Bay, that it was deemed inexpedient to make use of them; and the records for Race Point light-house, at the northern extremity of Cape Cod, show such extreme variations within short periods, due probably in part to the very gradually sloping shore in front of the light, as to render their value questionable until further examination can be made.

The outside stations differ widely in the character of their surroundings, and therefore do not afford the means of obtaining observations of equal value respecting the open waters along the coast. Ten are light-ships, anchored off shore, in depths of 5 to 18 fathoms, and consequently possessing unusual advantages for the taking of ocean temperatures; nine are located on small islands or reefs, more or less widely separated from the mainland; and five are situated on the shore of the mainland or on large islands, the last, as a rule, forming the least desirable stations of the series. Some of those stations situated on small islands or reefs also show considerable variations of temperature due to local influences, as described further on.

The arrangement of stations followed in this report is generally from south to north, this order affording the most natural sequence for comparing the different ranges of temperature in successive latitudes. The locations and general characteristics of the stations are as follows: *

THE FLORIDA REEFS.

Dry Tortugas light-house.—Located on the western island of the Tortugas, at the southwestern extremity of the Florida Reefs. The light-house is situated on the eastern side of Loggerhead Key (or island), which is bordered by a channel having depths of 10 to 12 fathoms and occupied by strong tidal currents. The surface temperature observations were taken where the water is only 5 feet deep, and show indications of local influences, which render them more or less unsatisfactory with respect to the open waters surrounding the reefs.

Carysfort Reef light-house.—Located near the northeastern end of the Florida Reefs, about 158 miles from the Dry Tortugas light-house, and on the outer side of Carysfort Reef. Depths of 50 fathoms occur within 2 miles of the light. Observations were taken in a depth of only 3 feet, but evidently in a more exposed position than at the Tortugas station, as the effects of local influences are less apparent in the surface temperature records.

Fowey Rocks light-house.—Located on the outer edge of Fowey Rocks, at the northeastern extremity of the Florida Reefs, and 23 miles from Carysfort Reef. The 100-fathom curve is distant about $2\frac{1}{2}$ miles. The depth of water at the place of observation is 5 feet, and the water temperature records compare favorably with those of Carysfort Reef, indicating a similar exposure.

SOUTH CAROLINA.

Martin's Industry light-ship.—Anchored in 9 fathoms of water, about $8\frac{1}{2}$ miles from land, off the entrance to Port Royal Sound; distant about 390 miles from Fowey Rocks light-house.

Rattlesnake Shoal light-ship.—Anchored in 5 fathoms of water, about 5 miles off land, just north of the entrance to Charleston Harbor, and about 56 miles from Martin's Industry light-ship.

NORTH CAROLINA.

Frying Pan Shoals light-ship.—Anchored in 10 fathoms of water, about 17 miles southeast of Cape Fear, and about 108 miles from Rattlesnake Shoal light-ship.

Cape Lookout light-house.—Located on the outer shore, about 3 miles north of the extremity of Cape Lookout, and 90 miles from Frying Pan Shoals light-ship. The observations were taken at the lower edge of the beach in a depth of 1 foot of water. The bottom slopes gradually, and attains a depth of 10 fathoms about 5 miles from shore. Although the maximum and minimum surface temperatures at this station correspond closely with the same at Frying Pan Shoals, the surface curves are much less regular, and show direct atmospheric influence.

* For more complete descriptions, reference should be made to the explanations of the charts.

Body's Island light-house.—Located near the southern end of Body's Island, about 35 miles north of Cape Hatteras, and 86 miles from Cape Lookout. The shore is similar in character to that at Cape Lookout, but the surface observations were taken where the depths are from 7 to 9 feet. The temperature curves for the surface and air are almost precisely alike, and the observations cannot be regarded as of any value with respect to the open waters off shore.

• VIRGINIA.

Winter Quarter Shoal light-ship.—Anchored in $10\frac{1}{2}$ fathoms of water, $8\frac{1}{2}$ miles off Assateague Island, and about midway between the entrances to Chesapeake Bay and Delaware Bay; distant about 128 miles from Body's Island.

NEW JERSEY.

Five-Fathom Bank light-ship.—Anchored in 12 fathoms of water, about 14 miles off the coast, just east of Cape May, and off the entrance to Delaware Bay; distant about 56 miles from Winter Quarter Shoal light-ship.

Absecon light-house.—Located on the beach in front of Atlantic City, and just south of the entrance to Absecon Inlet; $34\frac{3}{8}$ miles distant from Five Fathom Bank light-ship. The shore is faced with shoals, but the surface observations were taken in the channel leading to the inlet, in depths of 9 to 15 feet of water. The surface records are much more satisfactory than at either of the previous shore stations (Cape Lookout and Body's Island), and the surface curves are nearly as regular as at Five Fathom Bank light-ship.

NEW YORK.

Sandy Hook light-ship.—Anchored in 14 fathoms of water off the entrance to New York Bay; 6 miles east of Sandy Hook, N. J., the nearest land; and about 70 miles from Absecon light.

Fire Island light-house.—Located on the east side of Fire Island Inlet, south side of Long Island, 31 miles from Sandy Hook light-ship. The surface observations were taken in the entrance to Great South Bay, between Fire Island and Oak Island, in 3 feet of water. A strong current flows through the channel, which is somewhat similar in character to the entrance to Absecon Inlet.

RHODE ISLAND.

Block Island southeast light-house.—Located at the southeastern corner of Block Island, 82 miles from Fire Island light. The observations were taken at the lower edge of the beach, which faces the open sea to the south. The surface temperature curves are comparatively regular and show less variation from local influences than would be expected at a shore station of its character.

Brenton's Reef light-ship.—Anchored in $14\frac{1}{2}$ fathoms of water, off the entrance to Narragansett Bay, and about $1\frac{1}{2}$ miles from land; $17\frac{1}{2}$ miles distant from Block Island southeast light.

MASSACHUSETTS.

Vineyard Sound light-ship.—Anchored in 15 fathoms of water, on the western side of the southern entrance to Vineyard Sound, $2\frac{1}{2}$ miles from Cuttyhunk Island, the nearest land, and $17\frac{1}{2}$ miles from Brenton's Reef light-ship.

Nantucket New South Shoal light-ship.—Anchored in 16 to 18 fathoms, at the southern edge of Nantucket shoals, and 21 miles southeast of Nantucket Island, the nearest land; distant about 58 miles from Vineyard Sound light-ship. This station occupies a very important position with reference to the off-shore fisheries.

Pollock Rip light-ship.—Anchored in 5 to 7 fathoms of water, in the eastern entrance to Nantucket Sound, and $3\frac{1}{2}$ miles SE. by E. $\frac{1}{4}$ E. from Monomoy Point light-house, Cape Cod; distant about 36 miles from Nantucket New South Shoal light-ship. This light-ship is mostly surrounded by numerous shoals which are separated by channels occupied by strong tidal currents.

Thatcher's Island lights.—Located on Thatcher's Island, off the eastern extremity of Cape Ann, about 73 miles from Pollock Rip light-ship. Depths of 60 fathoms occur within a distance of $6\frac{1}{2}$ miles to the eastward. The surface temperature observations were taken where the water is 7 feet deep, and show variations from local influences. Observations were first made at this station by one of the light-house keepers, but after April, 1881, by an observer of the U. S. Signal Service.

MAINE.

Boon Island light-house.—Boon Island is a small rocky island lying off York Harbor, and $5\frac{1}{2}$ miles from the nearest land. It is distant about 35 miles from Thatcher's Island, and is surrounded by depths of $5\frac{1}{2}$ to 25 fathoms within a radius of 1 mile. The depth of water where the surface observations were taken is 9 feet. Many gaps occur in the records of this station, and the reductions plotted on the chart are therefore probably not reliable.

Seguin Island light-house.—Seguin Island is small and rocky, and is situated about $2\frac{1}{2}$ miles off the nearest point of the mainland, on the eastern side of the entrance to Kennebec River, and about 47 miles from Boon Island. The light-house is on the western side of the island, where the water is from 6 to 8 fathoms deep close inshore at the place of observation.

Matinicus Rock light-house.—Matinicus Rock is a rocky islet about 14 miles south of Vinal Haven, at the mouth of Penobscot Bay, and about 80 miles from Seguin Island. Depths of 4 to 45 fathoms occur within a radius of 1 mile, the depth where the surface observations were taken ranging from 6 to 12 fathoms.

Mount Desert Rock light-house.—Mount Desert Rock is similar in character to Matinicus Rock, and is situated about 13 miles off Mount Desert Island and 34 miles from Matinicus Rock. Within a radius of 5 miles the depths

range from 50 to 95 fathoms; the depths of water where the observations were taken were 2 to 10 fathoms; the records are about as imperfect at this station as at Boon Island.

Petit Manan light-house.—Petit Manan Island consists of a group of low, rocky islets, situated about 2 miles from land, off the western entrance to Pigeon Hill Bay, and 27 miles from Mount Desert Rock. They are surrounded by deep water, the observations having been taken where the depths range from 8 to 15 fathoms.

RELATIVE POSITIONS OF THE STATIONS.

The three most southern of the temperature stations, those at the Tortugas, Carysfort Reef, and Fowey Rocks, are located on the northern and western edge of a deep and comparatively narrow channel, called the Straits of Florida, which extends first easterly from the Gulf of Mexico and then northerly into the Atlantic Ocean. This channel, which is occupied for its entire width and length by the Gulf Stream, is bounded on the north and west by Florida, on the south by Cuba, and on the east by the Bahama banks and islands. Its length is about 350 miles, but the temperature stations are limited to its central and western portions, all being situated on the Florida Reefs. In front of the Tortugas, the 100-fathom curve is distant about 15 miles from the southern edge of the reefs, which are located at the southern end of the submerged continental slope bordering the west coast of Florida for a width of 110 to 145 miles. At Carysfort Reef, the 100-fathom curve is distant only about 7 miles from shore, and at Fowey Rocks only 2½ miles. The deepest water in the straits occurs at the western entrance, opposite the Tortugas, and in places exceeds 1,000 fathoms, the southern and eastern sides of the straits being generally deeper than the northern and western. The influence of the great body of warm water composing the Gulf Stream is felt directly upon the Florida Reefs, although these reefs are known to be bathed by a narrow counter current flowing to the westward. The axis or warmest band of the Gulf Stream passes nearer the southern and eastern than the Florida side of the channel.

The Tortugas Reefs are situated at the western end of the Straits of Florida, on the northern side, where the distance across from land to land is about 90 miles. The Tortugas station, however, is in a somewhat protected position, and local influences are perceptible in the temperature records. At Fowey Rocks, the width of the channel is reduced to about 40 miles, this width being the least of any in the straits. The stations at Carysfort Reef and Fowey Rocks both occupy more exposed positions than the one at the Tortugas, and are therefore better located for ascertaining the temperature of the open waters bordering the reefs.

Between the Florida Reefs and the first station to the north (Martin's Industry light-ship, South Carolina), a distance of about 6½ degrees of latitude intervenes. Within this distance the 100-fathom curve and the inner edge of the Gulf Stream gradually recede from the coast line as far as Georgia, whence to near Cape Lookout, North Carolina, they retain a nearly uniform distance from the shore. Along this section of the coast the submerged continental plateau has an average width of about 55 miles to the 100-fathom curve, which lies just within the inner edge of the Gulf Stream or "Cold Wall." The bottom slopes gradually from the shore into depths of about 50 fathoms, beyond which the descent is very rapid. Just south of Cape Lookout the 100-fathom curve bends in somewhat toward the shore, and in front of Cape Hatteras the submerged continental border is only about one-third as wide as it is farther south, the Gulf Stream also approaching nearer to the land. North of Cape Hatteras the 100-fathom curve again recedes from the shore and the Gulf Stream is deflected toward the east.

Between Georgia and Cape Hatteras there are four stations, of which three are light-ships, located several miles off shore, in depths of 5 to 11 fathoms. Martin's Industry light-ship is off the entrance to Port Royal Sound, South Carolina, in front of Martin's Industry Shoal, which separates the south and southeast channels; Rattlesnake Shoal light-ship is just north of the

entrance to Charleston Harbor, and Frying Pan Shoals light-ship is 17 miles off Cape Fear, North Carolina. It is possible that the fresh waters emptying into the sea in the neighborhood of the two former stations may influence the surface temperatures to a greater or less degree, but the distance of these light-ships from shore makes this supposition improbable. Cape Lookout light-house is a shore station affording results of local value only, and Body's Island light-house, about 35 miles north of Cape Hatteras, is of the same character.

At Winter Quarter Shoal light-ship, Virginia, the next station north of Body's Island, the 100-fathom curve is distant about 55 miles from shore, the submerged continental plateau having about the same width here as to the south of Cape Lookout. At Five-Fathom Bank the width increases to over 65 miles; opposite New York Bay entrance it is about 100 miles wide, and in front of Nantucket Island about 80 miles wide. The slope of the bottom along this part of the coast is also very gradual until a depth of about 50 fathoms is reached, the distance between the 50 and 100 fathom curves being only 5 to 15 miles. The inner edge of the Gulf Stream is distant from the shore at Winter Quarter Shoal about 100 miles; at Five-Fathom Bank about 140 miles; at Nantucket Island about 200 miles, and, therefore, bears no relation to the submerged continental border, north of Cape Hatteras, as determined by the 100-fathom curve.

Winter Quarter Shoal and Five Fathom Bank light-ships are the two most southern stations on this part of the plateau, and both are favorably situated, the former $8\frac{1}{2}$ miles off shore in a depth of 10 fathoms; the latter 14 miles off shore in a depth of 12 fathoms. The next light-ship to the north is that off Sandy Hook, New Jersey, which is anchored in 14 fathoms of water. Being located directly off the mouth of New York Bay, the surface waters at this station may possibly be influenced to some extent by the outflow from the Hudson River, especially in the early spring after the ice has broken up, but there is no special evidence to that effect. Between Delaware Bay and Rhode Island there are three shore stations, two (Absecon and Fire Island) situated upon tidal inlets, and one (Block Island) upon an ocean beach. The two former have furnished better observations than would ordinarily be considered possible in such places.

East of Block Island there are four temperature stations off the southern coast of New England, all of which are well located. The Brenton's Reef and Vineyard Sound light-ships belong to the area included between Block Island and Martha's Vineyard. Pollock Rip light-ship is at the eastern entrance to Nantucket or Vineyard Sound, and, although surrounded by shoals, is in the midst of strong tidal currents, which are probably not influenced by the neighboring land. Nantucket New South Shoal light-ship occupies one of the most exposed positions on the coast, and is distant over 20 miles from the nearest land. A series of stations like this one, distributed along the entire coast, could be made to furnish most important data respecting the fisheries.

The Gulf of Maine, in which the remaining stations are located, is a moderately deep basin, surrounded on the west, north, and northeast by land, on the south by George's Bank, and on the east by Brown's Bank, in part, and the shoal water off Cape Sable, Nova Scotia. The Bay of Fundy opens into it from the northeast. This area contains many banks and ledges, and the bottom contour lines are very irregular. The 50-fathom curve is nowhere distant from the land, and along the northern coast, where most of the stations are situated, approaches close to it. The 100-fathom curve is also not very far distant from the Massachusetts coast, and approaches the coast of Maine between Mount Desert and Machias. The most southern station is on Thatcher's Island, off Cape Ann, an important location, though, unfortunately, the observations were taken in too shallow water to make them of value with respect to the open waters of the gulf. Boon Island is in the western part of the gulf, midway between Cape Ann and Portland. Seguin Island, Matinicus Rock, and Mount Desert Rock are in nearly the same latitude, the first mentioned being near

the mainland, the two latter close to the 50-fathom curve. Petit Manan Island, like Seguin, lies but a short distance off the mainland, and is the most northern and eastern station of the series.

COMPARISON OF THE STATIONS WITH RESPECT TO TEMPERATURE.

As explained elsewhere, the stations do not all afford temperature observations of equal value on account of differences in the nature of their surroundings. Many of the stations included in this report do not, therefore, furnish correct data with respect to the open waters of the coast, but the character of the surface observations may be more or less accurately determined by a study of their relations to the air temperatures. The light-ships, being all located off shore in depths exceeding 5 fathoms, are naturally best adapted for the taking of ocean temperatures, while next in order of excellence, as a rule, are the light-houses situated on small islands and reefs, more or less distant from the mainland. The records for January and February at nearly all the stations north of Cape Hatteras have not been used, on account of the manifest errors of observation sometimes made during extremely cold weather, by not reading the thermometer quickly enough after it has been withdrawn from the water. These errors do not appear to extend much into either December or March, although at some stations the records for those months may show too low a range of temperature by a very small amount. However, the winter surface temperatures are not of much importance in connection with any fishery problem north of Cape Hatteras.

At the extreme south we recognize a group of stations which differ from all the others in the conditions of temperature. It includes only the three light-houses of the Florida Reefs, bordering the Gulf Stream. At Carysfort Reef and Fowey Rocks the curves of surface temperature are more regular than at the Tortugas and correspond less closely with the air curves, indicating fewer local influences or more open exposures at the places of observation. The three succeeding light-ships, Martin's Industry, Rattlesnake Shoal, and Frying Pan Shoals, afford more or less uniform results, the plottings forming much more pronounced curves than at the Florida Reefs; the surface curves are most regular at the first mentioned light-ship. Cape Lookout is a shore station at which the irregularities in the air curves are almost exactly repeated in the surface curves, although the maximum surface temperature is no higher than at Frying Pan Shoals light-ship. At Body's Island, another station on the mainland, both the air and surface curves indicate extreme fluctuations in temperature, which are almost precisely alike for both the air and surface. The surface lines at Winter Quarter Shoal and Five-Fathom Bank light-ships correspond closely in their general curvature, and also in many of their details. At Absecon Inlet, the third shore station, the water curves are more regular than at either Cape Lookout or Body's Island, but the maximum temperature is the same for both the air and water. The surface curves differ considerably from those of the air at Sandy Hook light-ship, and at Fire Island and Block Island the results are much more satisfactory than at any of the other shore stations, in both cases the maximum surface temperatures being about 8° lower than the maximum air temperatures. At the three succeeding light-ships, Brenton's Reef, Vineyard Sound, and Nantucket New South Shoal, the surface curves are all comparatively regular; but at Pollock Rip light-ship, they present many irregularities which do not, in all cases, correspond with those of the air. The fluctuations of temperature are still greater at Thatcher's Island, where the observations were taken in a sheltered position in shallow water. Of the islands in the northern part of the Gulf of Maine, the most regular and uniform series of surface curves are presented by Matinicus Rock, Seguin Island affording the next best series in that respect. At the three other stations the surface curves are less regular, especially from 1881 to 1883, inclusive, but the irregularities do not appear to be due, in most cases, to atmospheric influence.

THE FLORIDA REEFS.—Excluding the observations for the Tortugas, the extreme range of surface temperature at the Florida Reefs is $16^{\circ}.5$, with a maximum of $86^{\circ}.5$. The maximum at the Tortugas is about the same, but the minimum is 5° lower. The air temperature presents a range of 18° to $21^{\circ}.5$, the air maximum being about the same as the surface maximum at Fowey Rocks, $2^{\circ}.5$ higher at the Tortugas, and $2^{\circ}.5$ lower at Carysfort Reef. At none of the other stations along the coast do we find nearly so short a range either of surface or air temperature, and these are the only stations that are situated directly within the influence of the Gulf Stream.

SOUTH CAROLINA TO VIRGINIA.—At the light-ships of Martin's Industry Shoal and Rattlesnake Shoal, the range of air temperature is 41° , the surface range 38° , the maximum for the air being $86^{\circ}.5$, the maximum for the water 85° , or about $1^{\circ}.5$ lower than at the Florida Reefs. The greater range of temperature at these two light-ships, and at the stations immediately following them toward the north is due to the much lower temperatures of winter, amounting to over 20° , the differences in the maximums being slight. At Frying Pan Shoals light-ship, the maximums of both air and surface temperatures are slightly lower, the air range being the same as at Rattlesnake Shoal, the surface range only 33° , with a maximum of $82^{\circ}.5$. The records for Cape Lookout and Body's Island, show approximately the same range for both air and surface temperature at each, amounting to about 42° at the former station, and 64° at the latter.

VIRGINIA TO NEW YORK.—North of Chesapeake Bay the maximums of surface temperature are much lower than to the south, reaching $76^{\circ}.5$ at Winter Quarter Shoal light-ship, and about the same at Five-Fathom Bank light-ship. This is 6° lower than at Frying Pan Shoals, the first light-ship south of Cape Hatteras, and about 9° lower than at Rattlesnake Shoal and Martin's Industry light-ships. At the northern stations, beginning with Winter Quarter Shoal light-ship, the temperature plottings for January and February have been omitted in most cases, and the ranges of temperature, where given, are, unless otherwise stated, for only ten months. At Absecon Inlet, on the mainland, the surface maximum is about 3° higher ($79^{\circ}.5$) than at the two preceding light-ships, and agrees with the air maximum; at Sandy Hook light-ship the surface maximum is $1\frac{1}{2}^{\circ}$ to 2° lower than at Five-Fathom Bank and Winter Quarter Shoal, and 7° lower than the air maximum at the same place; at Fire Island the surface maximum is 8° lower than the air maximum, and about the same as the surface maximum at Sandy Hook, showing more satisfactory observations than at any of the previous shore stations.

BLOCK ISLAND TO CAPE COD.—The surface maximum at Block Island is $8^{\circ}.5$ lower than the air maximum, and only $1^{\circ}.5$ higher ($70^{\circ}.5$) than at the nearest light-ship, which is about 18 miles distant. Brenton's Reef and Vineyard Sound light-ships afford closely corresponding results, the maximum of both air and surface temperature being slightly lower at the latter station. The surface maximum at Brenton's Reef is 69° , being $5^{\circ}.5$ lower than at Sandy Hook, $7^{\circ}.5$ lower than at Winter Quarter Shoal, 16° lower than at Martin's Industry, and $17^{\circ}.5$ lower than at the Florida Reefs, the maximum for Brenton's Reef being a little lower than the minimum for the Florida Reefs. At Nantucket New South Shoal, and Pollock Rip light-ships, the maximums of surface temperature are approximately the same, about 62° , and the range of temperature is but slightly less at the former station; the air maximum is 3° higher at Nantucket than at Pollock Rip. The surface maximum is the same at these two light-ships as at Boon Island, in the Gulf of Maine, which has also approximately the same range, 29° for 10 months. This range is much shorter than at Vineyard Sound light-ship and preceding stations, while the air range remains about the same. The surface curves at Nantucket New South Shoal and Pollock Rip are, therefore, straighter in comparison with the air curves than at the more western stations, and this same feature will also be found characteristic of the stations in the Gulf of Maine.

GULF OF MAINE.—Considerable differences occur in the maximums of both air and surface temperatures at the several stations in the Gulf of Maine. Aside from Thatcher's Island, the highest air maximum is 75°·5, at Mount Desert Rock, the lowest 65°, at Matinicus Rock; the highest water maximum is 62°, at Boon Island, the lowest 54°, at Matinicus Rock. As to the surface curves, Boon Island agrees most closely with Pollock Rip and Nantucket New South Shoal, while Matinicus Rock and Mount Desert Rock afford the lowest surface maximums of any of the stations on the entire coast.

Table showing the minimum and maximum temperatures of the air and surface water, and the ranges of air and surface temperature at the light-house stations, for the five years from 1881 to 1885, inclusive.

Stations.*	Period.	Air temperature.			Surface temperature.		
		Minimum.	Maximum.	Range.	Minimum.	Maximum.	Range.
		° F.	° F.	° F.	° F.	° F.	° F.
Petit Manan Island, Me	March 1 to January 1.	20	70	50	31	58.5	27.5
Mount Desert Rock, Me	do	25.5	75.5	50	33	54.5	21.5
Matinicus Rock, Me	do	23	65	42	32.5	54	21.5
Seguin Island, Me	do	24	70.5	46.5	33	58	25
Boon Island, Me	do	22.5	73.5	51	33	62	29
Thatcher's Island, Mass	Entire year	30	78.5	48.5	35	67	32
Pollock Rip, Mass	March 1 to January 1.	27	66	39	32	62.5	30.5
Nantucket N. S. Shoal, Mass	Entire year	26	69	43	33.5	62	28.5
Vineyard Sound, Mass	March 1 to January 1.	28.5	71.5	43	31	68	37
Brenton's Reef, R. I.	do	29	74.5	45.5	34	69	35
Block Island, R. I.	do	22	79	57	29.5	70.5	41
Fire Island, N. Y.	do	35	83.5	48.5	35	75	40
Sandy Hook, N. Y.	do	31.5	81.5	50	33	74.5	41.5
Absecon Inlet, N. J.	do	33	79.5	46.5	34.5	79.5	45
Five-Fathom Bank, N. J.	do	36.5	83.5	47	37	76	39
Winter Quarter Shoal, Va.	do	33	81	48	35.5	76.5	41
Body's Island, N. C.	Entire year	27	91	64	28	91	63
Cape Lookout, N. C.	do	43	84	41	42	84	42
Frying Pan Shoals, N. C.	do	44	85	41	49.5	82.5	33
Rattlesnake Shoal, S. C.	do	45.5	86.5	41	47	85	38
Martin's Industry, S. C.	do	45	86.5	41.5	47	85	38
Fowey Rocks, Fla.	do	68	86	18	70	86.5	16.5
Carysfort Reef, Fla.	do	65.5	84	18.5	71.5	86.5	15
Tortugas, Fla.	do	67	88.5	21.5	65.5	86	20.5

* The names of light-ships are printed in italics.

RELATIONS OF THE TEMPERATURE CURVES.

A comparison of the temperature curves for corresponding years at successive stations shows great uniformity in their relative positions and also in those irregularities which are indicative of more or less rapid changes of temperature. This uniformity often extends to stations that are widely separated or differently situated. Between January 20 and April 10, 1881, there were three separate periods during which the temperature fell below the average for that time of year at the southern stations. These several periods of low temperature are well brought out for both the air and surface by marked deflections in the curves beginning at the Tortugas and extending as far as Body's Island, the most northern station at which the temperature observations have been plotted for January and February. North of Body's Island, the last of these three periods, occurring between March 21 and April 10, can be traced as far as the Gulf of Maine, although at the northern stations the temperature at that time was not always lower than in other years. Again, between November 16 and December 16, 1882, another unusually cold spell is indicated on all the charts from the Tortugas to the Gulf of Maine. Many other indications of conformity between the

temperature curves at different stations will be observed on even a very superficial comparison of the charts. It will also be noticed that, while at the southern stations the temperature curves are generally most regular during the summer months, the reverse is true of the extreme northern ones.

THE SURFACE ISOTHERMS.

The purpose in view in preparing the charts of surface isotherms (Nos. 26 to 31), has been to present the temperature observations on which this report is based, in what appears to be the most convenient form for use in connection with such fishery problems as are suggested by the migrations of surface schooling fishes. If such species as the mackerel are controlled in their movements toward the north by conditions of temperature that are constant for all latitudes, a line drawn upon a chart to indicate their progress with reference to time must agree more or less closely with some line of equal temperature projected from point to point along the same coast. This supposition expresses in a general way the belief of many persons who have studied the migrations of mackerel and other economic fishes, but up to the present time sufficient data have not been collated to render possible the practical application of the principle to those species that live solely in salt water.

The isothermal charts are seven in number; one for each of the five years from 1881 to 1885, inclusive, one representing the means of the same five years, and the final one illustrating the relations of the air and surface isotherms. The annual charts are of most importance for fishery purposes, as, in showing the changes of position of the isothermal lines from year to year, they may possibly serve to explain the causes of the irregularity in the appearance of certain species upon different parts of the eastern coast in different years. A few words of explanation are necessary respecting the construction and contents of these charts.

Although, as elsewhere explained, the temperature results are not of equal value at all the stations, the latter have all been included in the charts, for the reason that it was impossible to determine satisfactorily, excepting in a few cases, which should be excluded. The observations at Cape Lookout, Bodys Island and Absecon Inlet evidently do not apply to the open waters of the coast, and the same is probably true to some extent with respect to a few of the other mainland and island stations. The three stations specially referred to have not generally been considered in discussing the isothermal charts. The data for the construction of the charts has been taken from the original temperature records, and not from the reductions to ten-day means, although the latter have been considered in deciding every date used in constructing the isotherms. In determining the dates for each isotherm no observations were considered unless the means of twenty consecutive observations (ten days) equalled or exceeded the temperature of that isotherm, except in a few instances elsewhere explained. The temperature of 40°, for example, might be reached at any station either within the first ten-day period indicated upon the special chart of that station (charts of ten-day means) as having a mean of more than 40°, or in the latter part of the previous ten-day period; but the mean temperature for the ten days following and including the date of the isotherm must not be under 40°. For the isotherms during the period of falling temperature in the last half of the year this order is reversed.

In constructing the charts, the names of the stations have been arranged vertically, in geographical sequence, on the left hand side of the chart. The remainder of the chart is divided into thirteen vertical spaces, each representing one month, that on the extreme right being for the month of January of the year following that to which the chart relates. Each month is further divided by the fainter lines into five equal parts, for convenience in reading the dates. The iso-

thermal lines are constructed for every five degrees of temperature from 40° to 80° , and are carried vertically from station to station, connecting the dates at which the temperatures they represent were reached at each station; the data for each separate station are to be read across the chart from left to right. Two series of isotherms are actually included on each chart, one relating to the period of rising temperatures in the first half of the year, the other to that of falling temperatures in the last half of the year. The space included between any two isotherms of equal value is supposed to represent a period during which the temperature was always equal to or above that indicated by the isotherms. Those portions of the isothermal lines consisting of dashes denote the lack of observations for the stations opposite them. Complete breaks in the lines generally indicate that the temperature did not reach the isotherm at that station during the year, or during the period of either rising or falling temperature.

In explanation of the arrangement, reference may be made to the isothermal chart for 1881 (No. 26). In that year the isotherm of 40° did not extend south of Body's Island, where the temperature reached 40° about the middle of February. At Winter Quarter Shoal the same temperature was reached March 20; at Five-Fathom Bank, April 15; at Absecon Inlet, March 20; at Sandy Hook, April 14; at Fire Island, April 8; at Block Island, April 16. The temperature remained above 40° throughout the rest of the year, and until after January, 1882, at Body's Island, Winter Quarter Shoal, Five-Fathom Bank, and Sandy Hook; until January 2, 1882, at Absecon Inlet; until December 31, at Fire Island; and until January 1, at Block Island. The isotherms of 45° , 50° , 55° , &c., are reached at successively later dates during the period of rising temperature, and at earlier dates during the period of falling temperature, but the intervals between them vary greatly at the different stations.

RANGES OF THE ISOTHERMS.

A detailed comparison of the isothermal charts would tend to confuse rather than to aid reference to them, and our remarks on the subject will be limited to a few statements respecting the range and general position of the isotherms.

The isotherms of 40° and 45° are generally co-extensive in their range. They always reach as far north as Petit Manan, and frequently as far south as Body's Island, but may stop at either Winter Quarter Shoal or Five-Fathom Bank; in 1882, the isotherm of 40° extended south only as far as Absecon Inlet. The isotherm of 50° begins at the north at Petit Manan, and at the south may terminate at Cape Lookout or Martin's Industry. The isotherms of 55° to 70° , inclusive, always reach south to Martin's Industry, but no farther; while those of 75° and 80° are the only ones ranging along the Florida Reef stations to the Tortugas. A temperature of 55° is often recorded at Petit Manan, but seldom at the next two stations to the westward—Mount Desert Rock and Matinicus Rock. South of here the isotherm of 55° is generally continuous. The temperature usually reaches 60° at Boon Island and Thatcher's Island (although at the latter station observations are wanting for 1884 and 1885), but during some years remains lower than this at Pollock Rip and Nantucket New South Shoal. The isotherm of 65° generally extends northward to Vineyard Sound, but in 1884 it began at Brenton's Reef; that of 70° extends north to Fire Island or Block Island. Absecon Inlet is the northern limit of the isotherm of 75° , which in some years, however, does not reach north of Body's Island or Cape Lookout. The isotherm of 80° does not pass north of Body's Island.

CHANGES IN POSITION OF THE ISOTHERMS IN DIFFERENT YEARS.

During the five years represented by the charts there is considerable change in the positions of the isotherms of equal value from year to year, frequently amounting to a month in time, and

occasionally to much more. The differences are greater at some stations than at others, and are seldom nearly the same at any station for two or more isotherms of different values. At Nantucket New South Shoal, for example, the isotherms of 40° for five years, during the periods of rising temperature, all appeared within four days of the same date, while those of 45° are distributed over a period of about eighteen days. At the next station to the north—Pollock Rip—the isotherms of 40° cover a period of over forty days, and those of 45° , a period of twenty-four days. At Petit Manan the isotherms of 40° and 45° are remarkably constant in position from year to year. The isotherms of 45° and 50° appear to be the most uniform in that respect for their entire range during the five years; but no two isotherms of equal value retain the same relative positions throughout their range. There may be comparative regularity with respect to several consecutive stations, but they generally cross one another one or more times, and while the isotherm of 40° for 1881 precedes that of 40° for 1882, between Mount Desert and Pollock Rip, at the more southern stations the reverse is true. The differences and irregularities in the positions of the yearly isotherms are so great that no definite laws respecting their relations over an extended range of coast can be deduced from the materials used in the preparation of this report.

GENERAL POSITIONS OF THE ISOTHERMS.

FORTY DEGREES.—The five isotherms of 40° (1881-'85), during the period of rising temperature in the spring, pass from Winter Quarter Shoal to Fire Island in March and the first half of April, from Block Island to Pollock Rip mostly in April, and reach the Gulf of Maine in the latter part of April or first half of May. At Petit Manan this temperature appears with great regularity about the middle of April. During the period of falling temperature, the isotherms of 40° are confined for the most part to the month of December, although they sometimes extend into January of the following year, and, as a whole, are more nearly vertical in their direction than those of the first half of the year.

FORTY-FIVE DEGREES.—From Winter Quarter Shoal to Fire Island the isotherms of 45° , during the period of rising temperature, fall mostly within the month of April, but during two years at Absecon Inlet, and one year at Winter Quarter Shoal, that temperature first appeared in the last half of March. From Block Island northward the same isotherms extend, in a general way, obliquely across the month of May into the first part of June at Matinicus Rock and Mount Desert Rock; they reach Petit Manan in the last of April or first part of May, or earlier than at any other station in the Gulf of Maine. During the period of falling temperature, the isotherms of 45° in the Gulf of Maine are mostly confined to the month of November, and farther south to the last part of November and December.

FIFTY DEGREES.—On the coast of South Carolina, the isotherms of 50° occur in January and February, during the rise of temperature; at Winter Quarter Shoal not until May, and at Absecon Inlet in the last part of April and first half of May. From this point they extend obliquely across the months of May and June, reaching Nantucket New South Shoal in the first part of June, Matinicus Rock in July, Mount Desert Rock between May 24 and July 12, and Petit Manan between June 8 and July 10. The same irregularities in the positions of the isotherms occur during the period of falling temperature in the Gulf of Maine, where they cover a period extending from September 10 to November 26. From Pollock Rip to Absecon Inlet the same isotherms are mostly limited to the month of November, and from Five-Fathom Bank to Martin's Industry they extend from the last of November into the first part of January.

FIFTY-FIVE DEGREES.—None of the isotherms of 55° can be plotted continuously east of Seguin Island, although at Petit Manan this temperature was recorded during all the four years

from 1882 to 1885, inclusive, and at Mount Desert Rock, during short periods in 1881 and 1883. South of Cape Lookout, the isotherms of 55° , during the season of rising temperature, occupy very different positions every year, ranging from January 1 to April 1. From Winter Quarter Shoal to Fire Island, they occur mostly between the 10th and last of May, from Block Island to Nantucket New South Shoal in June, and farther north in the last part of June or in July. During the period of falling temperature, they occur in the last part of August, September, or the first part of October, at Seguin Island, and in December or January on the coast of South Carolina.

SIXTY DEGREES.—The isotherms of 60° for 1885, are the only ones that extend northward continuously to Boon Island, the isotherms of that temperature during other years generally stopping at Nantucket New South Shoal. On the coast of South Carolina these isotherms are confined to March and April; from Winter Quarter Shoal to Fire Island, they occur during the last of May and first half of June; from Block Island to Vineyard Sound, in June; and at Nantucket New South Shoal, between July 14 and August 28. During falling temperature they appear at Nantucket New South Shoal between August 14 and October 1, and reach Martin's Industry between November 26 and December 18.

SIXTY-FIVE DEGREES.—The isotherms of 65° , during rising temperature, occur in April at Martin's Industry and Rattlesnake Shoal, in the first part of May at Frying Pan Shoals, but at Winter Quarter Shoal not until the middle of June or first part of July. Between Five-Fathom Bank and Fire Island they appear mostly in June, at Block Island in July, and at Brenton's Reef and Vineyard Sound in the last part of June and in July. During falling temperature, they occur at Vineyard Sound in August; at Block Island are exceedingly variable in position, ranging from August 8 to the last of September; and on the coast of South Carolina are mainly confined to the month of November.

SEVENTY DEGREES.—The isotherms of 70° sometimes extend to Block Island, but generally terminate at Fire Island. South of Cape Hatteras they are almost entirely confined to the month of May. From Winter Quarter Shoal northward they are exceedingly variable in position from year to year, during the periods of both rising and falling temperature, their extreme range in time in the former period being from June 18 to August 18, and in the latter from July 23 to October 14.

SEVENTY-FIVE DEGREES.—The isotherms of 75° are difficult to plot at the Florida Reefs on account of the frequent fluctuations in temperature, which generally occur between November and the following May. During those months there were often brief periods of higher temperature than 75° , which it was impossible to represent in connection with the isotherms, but they are all shown on the special charts of the three Florida stations. At Carysfort Reef and Fowey Rocks the isotherm of 75° may appear as late as the 18th of April, during rising temperature, and as early as the 24th of November during falling temperature. At Martin's Industry, during the period of rising temperature, they occur mostly in the extreme latter part of May and at Frying Pan Shoals in the first part of June. From Winter Quarter Shoal northward to Absecon, these isotherms, when they appear, are mainly confined to the last part of July and August.

EIGHTY DEGREES.—The period of higher temperature than 80° is shorter at the Tortugas than at the more northern stations of the Florida Reefs, and the isotherms of 80° of both series bend inward upon the chart at that place. At Carysfort Reef and Fowey Rocks these isotherms, on the rising temperature, were distributed, during the five years, between the 10th and the very last of May; at Martin's Industry and Rattlesnake Shoal between the 12th and last of June; and at Frying Pan Shoals between the 1st and middle of July. During the period of falling temperature they occupy a wider range in time, and extend obliquely from Frying Pan Shoals to Carysfort

Reef, at the former station occurring between August 1 and September 20, and at the latter between October 20 and December 8.

EIGHTY-FIVE DEGREES.—The surface waters seldom reach a temperature of 85° excepting for short periods at the extreme south, and it has been impossible to construct isotherms for more than one year at Martin's Industry and the Florida Reef stations. Temperatures of 85° and over were recorded between the 8th and last of July, 1881, at Rattlesnake Shoal, Fowey Rocks, and the Tortugas; between the first part of July and the last of August, 1883, at Carysfort Reef and Fowey Rocks; and in 1885, from August 2 to 26, at Martin's Industry, from July 29 to September 28, at Fowey Rocks, and from July 9 to September 25, at Carysfort Reef.

NINETY DEGREES.—A surface temperature of 90° was occasionally recorded at some of the extreme southern stations, but never for more than a day or two at a time.

MEAN ISOTHERMS BASED UPON FIVE YEARS' OBSERVATIONS.

In constructing chart No. 31, it was impossible, in all cases, to obtain the reductions of five years' observations, on account of occasional breaks in the records, but the number of years plotted is never less than three and generally more than four. The exact number in each instance may be determined by reference to the annual isothermal charts (Nos. 26–30).

On this chart the surface isotherms are represented as being much more regular and more uniformly distributed with reference to time than on any of the yearly charts. On the left-hand side of the chart, north of Body's Island, there is a wide area of low temperatures, bounded by the isotherms of 40° . From Winter Quarter Shoal to Fire Island, inclusive, this area represents a period of about seventy-five to one hundred days, being shortest at Five-Fathom Bank, and longest at Sandy Hook; from Block Island northward the length of this period varies from one hundred to one hundred and thirty-five days, being shortest at Brenton's Reef and longest at Boon Island. A narrower space of maximum temperatures extends vertically through the center of the chart, occupying principally the month of August, which is not crossed by any of the isotherms, although a few of them extend a short distance into it. The length of time elapsing between successive isotherms is generally from about twelve to twenty-four days, seldom less but often more. The isotherms are more numerous and follow one another more rapidly at the intermediate stations of the series than at the northern and southern stations; toward the north and south they diverge somewhat and become more widely separated. This naturally results from the fact that at the intermediate stations there is a much greater range of temperature (above a minimum of 40°) than at the northern and southern ones. In the eastern part of the Gulf of Maine there are only three continuous isotherms of the value of those plotted (40° to 50° , inclusive); in the western part four such isotherms (40° to 55° , inclusive). On the southern coast of New England there are five isotherms at Nantucket New South Shoal (40° to 60° , inclusive), and six from Vineyard Sound to Block Island (40° to 65° , inclusive); seven extend from Fire Island to Body's Island (40° to 70° , inclusive); four occur on the coast of South Carolina (55° to 70° , inclusive), and two at the Florida Reefs (75° to 80° , inclusive, and sometimes 85°).

North of Body's Island the isotherms of both series extend in a slightly oblique direction trending inward toward the north. At Cape Hatteras they bend abruptly, and the same isotherms appear much earlier in the year to the south of that important cape.

At Frying Pan Shoals, the first reliable station south of Hatteras, the isotherm of 55° appears about ninety days earlier than at Winter Quarter Shoal; the isotherm of 60° about sixty days earlier; the isotherm of 65° about fifty days earlier; and the isotherm of 70° also about fifty days earlier.

The isotherms of 75° and 80° also bend abruptly between South Carolina and the Florida Reefs, that of 75° occurring at Fowey Rocks about sixty days in advance of Martin's Industry, and that of 80° about twenty-six days in advance.

RELATIONS OF THE AIR AND SURFACE ISOTHERMS.

As stated in the explanation of Chart No. 32, there appears to be no constant relation between the air and surface isotherms at any of the light-house stations. During the periods of both rising and falling temperature, the air temperature of any degree, as a rule, precedes the surface temperature of the same degree, but the length of time intervening may vary from two or three days to over a month.

THE WIND RECORDS.

Very complete records respecting the direction of the winds were kept at all the stations excepting Thatcher's Island, the observations being taken twice each day, at the same time as the temperatures. The wind records are even more complete than are those for surface temperature, having fewer breaks at any of the stations; and as temperature is greatly influenced by the wind, it has been thought advisable to present in this connection a tabulation of the observations made. In this table (p. 176) the means of five years' observations for each month are arranged according to quadrants of the compass, beginning with the northeast quadrant. Northerly winds have been included in the same quadrant with northwesterly winds, to which they appear to be most nearly related in their effects upon temperature. The extent of the several quadrants is, therefore, as follows: *Northeast*, from NNE. to E., inclusive; *southeast* from ESE. to S., inclusive; *southwest* from SSW. to W., inclusive; *northwest* from WNW. to N., inclusive.

The general arrangement of the table scarcely requires an explanation. The data respecting the several stations are classified by quadrants under each month, and that for each station extends from left to right across the table. In the columns of figures, each one-tenth of a unit represents one observation, and each unit ten observations, extending through five years, the latter being equivalent to one day's observations for five years. The time ratio for each quadrant is, therefore, represented by days and fractions of a day. For example, at the Tortugas station in January, which has thirty-one days, the northeast quadrant shows a mean record of 14.9 days; the southeast of 7.2 days; the southwest of 2 days, and the northwest of 5.9 days, making a total of thirty days. The discrepancy of one day results from calms and variable winds. The terms used by the observers to express the velocity of the winds not being uniform at the different stations, it has been impossible to tabulate them.

At the Florida Reef stations northeasterly and southeasterly winds prevailed throughout the entire year, the records for the northwest and southwest quadrants being relatively small during nearly every month. Northeasterly winds predominated at the Tortugas during every month excepting June, in which the prevailing winds were southeasterly, and they afford an exceedingly high record during October, November, and December. The records for Carysfort Reef and Fowey Rocks, which are situated only about 23 miles apart, present some, though not considerable differences. At the former station northeasterly winds prevailed during February, May, September, October, and November; at the latter, during September, October, November, and December; the prevailing winds for the same stations during the other months being southeasterly. Northwesterly winds very rarely occur at the Florida Reefs during the summer months, and in only one instance did they exceed a mean of eight days during the winter months, that being at Carysfort Reef in December. Continuous winds from the north and northwest cause a marked reduction in

the temperature, as is strikingly illustrated in the chart for the Tortugas during March, 1881, and November and December, 1882. The same conditions of temperature prevailed to some extent at Carysfort Reef and Fowey Rocks during the same periods, but northwesterly winds were far less prevalent at those stations during 1881 and 1882 than at the Tortugas. This subject is further discussed in the explanations of the charts for the three Florida stations.

Passing northward from the Florida Reefs, the prevailing winds gradually change from north easterly and southeasterly to northwesterly and southwesterly. From Martin's Industry Shoal, South Carolina, to Cape Lookout, North Carolina, northeasterly winds generally prevailed during January, February, April, May, August, September, October, November, and December; and southwesterly winds during March, June, and July. A few slight exceptions to this rule are presented by some of these stations, and the wind records for two or even three quadrants are sometimes nearly alike during the same month. Northwesterly winds are no more common than at the Florida Reefs.

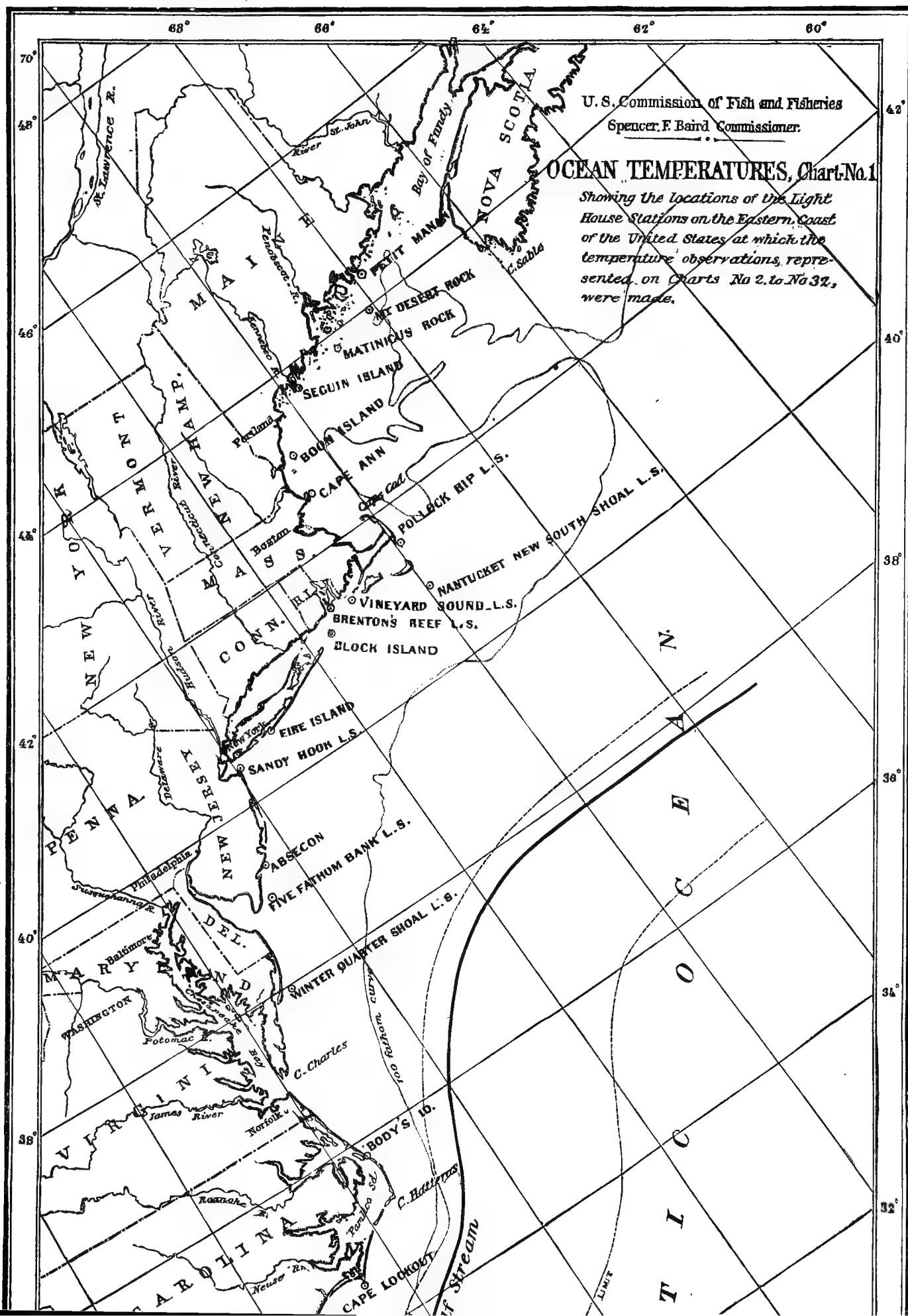
Body's Island, North Carolina, and Winter Quarter Shoal, Virginia, occupy an intermediate position between the southern and northern stations with respect to the winds as well as geographically. Northeasterly winds are less prevalent and northwesterly winds more common, especially during the colder months. At Five-Fathom Bank, New Jersey, northeasterly winds prevailed only during October, but they also furnished a relatively high record during May, August, and September. The prevailing winds at that station for January, February, March, April, November, and December were northwesterly; for May, June, July, August, and September, southwesterly. At Absecon Inlet, New Jersey, northeasterly and southeasterly winds prevailed from April to October, inclusive, and northwesterly winds during the other months. North of this station, northeasterly winds rarely prevailed during any month, but northeasterly and southeasterly winds are of much more frequent occurrence at the northern stations than are northwesterly and southwesterly winds at the extreme southern ones. Northwesterly winds generally prevailed from November to April, and southwesterly from April to November, but there are numerous exceptions to this rule, and at some of the stations southwesterly winds continued to be the prevalent ones through November and December. At Boon Island and Petit Manan, in the Gulf of Maine, southeasterly winds predominated during most of the summer months, and the record of winds from the northeast quadrant is very high at Boon Island, as also at some of the other stations on the coasts of Massachusetts and Maine.

Table showing the direction of the winds, by quadrants, for each month of the year, at the light-house temperature stations on the eastern coast of the United States, being the means of five years' observations, from 1881 to 1885, inclusive.*

Stations.	January.				February.				March.				April.			
	NE.	SE.	SW.	NW.	NE.	SE.	SW.	NW.	NE.	SE.	SW.	NW.	NE.	SE.	SW.	NW.
Petit Manan, Me.....	5.5	3.6	9.5	12.4	5	6	7.3	9.9	8.6	6	9.2	7.2	6.8	5.7	10.7	6.8
Mt. Desert Rock, Me.....	4.9	4.5	8.5	12.9	5.6	4.9	8	9.4	7.2	6.8	7.1	9.6	5.4	5.3	10.1	7
Matinicus Rock, Me.....	3.7	4.8	9.1	12.9	4.6	4.9	6.4	11.7	5.3	4.8	7.4	13.5	6.3	4.8	8	7.9
Seguin Island, Me.....	7.4	2.1	9.5	11.6	7.6	3.1	7.8	8.8	9	4.3	8	9.2	6.5	5.4	8.6	8.6
Boon Island, Me.....	7.8	3.2	9	10.9	9	3.6	7.2	6.4	9.3	5.9	5.5	10.5	9.1	8.8	3.9	8
Pollock Rip, Mass.....	4.5	5.3	7.7	13.4	5.4	3.9	8	10.7	5.7	4.1	10	10.7	6.6	4.1	10.5	7.6
Nantucket N. S. Shoal.....	4.8	4.4	7.1	13.7	4.1	4.2	5.7	12.6	5	4.5	5.8	13.8	7.3	3.6	8.2	8.8
Vineyard Sound light-ship, Mass.....	5.8	2.4	8.6	13.8	6.5	4.5	5.3	10.2	6.3	4.3	7.8	11.7	6.9	3.6	10.7	6.8
Brenton's Reef, R. I.....	4	3	8.7	14	5	3.3	6.3	12.1	5.5	4.4	6.4	13.2	6.2	4.6	9.6	8.5
Block Island, R. I.....	6.7	4.3	7.5	12.5	4.8	4.2	6.2	8.8	8.1	2.2	8.2	11.7	8.7	3.5	11	6.8
Fire Island, N. Y.....	5.8	1.7	7.3	11.6	4.6	4.2	6.4	9.6	5.3	3.8	6.6	10.9	4.5	4.6	8.9	7.6
Sandy Hook light-ship, N. Y.....	7	3	4.9	15.6	6.7	3.1	3.7	12.6	6	4.6	3.8	15	5.3	5.5	5.7	11.5
Absecon Inlet, N. J.....	5.2	2.8	6.9	16	7.2	2.8	5.3	12.9	7.8	4.3	6.2	12.7	9.7	6.7	4.9	8.5
Five-Fathom Bank, N. J.....	5.2	1.8	7.8	14.4	6.1	2.9	6.3	11.5	6.3	3.7	6.8	13.4	6.8	5.2	6.6	8.9
Winter Quarter Shoal, Va.....	9.5	2.7	8.6	9.9	7.7	4	7.8	7.9	8.1	5.3	6.8	9.9	9.4	5.7	6.9	6
Body's Island, N. C.....	8.4	3.5	10	9.1	8.2	5.3	6.4	7.5	9.6	5.1	8.9	7.4	12.9	6	6.7	5.2
Cape Lookout, N. C.....	11.5	2.9	7.5	7.7	10.2	2.7	9	4.6	8.6	3.9	10	6.8	10.8	3.2	8	4
Frying Pan Shoals, N. C.....	13.5	2.2	9.6	5	11.3	4.5	8.4	3.9	11	2.5	10.8	5.7	11.2	2	11.2	3.9
Rattlesnake Shoal, S. C.....	12.1	3	8.5	5.2	11.1	5.8	6.6	3.1	7	5.8	13.3	3.9	9.9	6.9	10	2.5
Martin's Industry Shoal, S. C.....	12	4.4	6.9	5.2	10.3	5.5	6.2	3.9	7.6	7.1	10.3	5.5	9.8	7.8	7.1	4.4
Fowey Rocks, Fla.....	11.6	13.1	2.9	3.3	9.1	10.3	2.3	5.9	8.9	10.5	4.2	6.8	9	12.1	4.5	3.7
Carysfort Reef, Fla.....	8.4	15	2.6	4.8	11	7	2.2	8	8.6	11.9	4.5	5.4	8.2	12.8	3.6	5.4
Tortugas, Fla.....	14.9	7.2	2	5.9	15.1	7	1.1	4.4	13.4	8.4	2.2	5.6	11.6	10.2	1.8	6

Stations.	May.				June.				July.				August.			
	NE.	SE.	SW.	NW.	NE.	SE.	SW.	NW.	NE.	SE.	SW.	NW.	NE.	SE.	SW.	NW.
Petit Manan, Me.....	8.5	10.5	8.4	3.6	3.7	11.1	11.8	3.4	3	14.8	11.4	1.8	3.8	13.6	11.3	2.3
Mt. Desert Rock, Me.....	7.1	8.3	10.9	3	2.5	8.9	13.3	3	1.7	9.9	14.3	2	3	7.3	14	3.1
Matinicus Rock, Me.....	6.6	9.6	9.2	4.3	2.7	8.5	12.8	4.4	2.4	9.4	13.9	2.9	3.7	7.3	12.9	3.4
Seguin Island, Me.....	9.3	8.8	9.2	2.9	4.9	6.8	13.8	3.4	3.9	7.4	15.6	3.2	4.9	7.5	14.2	3.4
Boon Island, Me.....	9.9	13	4.5	3.2	5.3	13.3	5.6	4.8	5.8	12.9	7.7	3.8	7.5	10	10.5	2.6
Pollock Rip, Mass.....	9.9	5.1	9.9	4.2	4.3	5.9	14.6	4	4	6	15.8	3.3	6.7	5.7	12.2	3.5
Nantucket N. S. Shoal.....	9.4	5.1	9.9	4	5.2	3.9	14.8	2.2	4.1	5.4	13	2.1	8.1	4.6	10.5	3.9
Vineyard Sound light-ship, Mass.....	8.6	5.8	12.3	3	4.3	5.5	16.3	2.9	4.4	5.3	16	3.6	6.3	5.4	14.8	2.1
Brenton's Reef, R. I.....	7.1	7.6	10.8	4	2.7	6.2	15	3.8	2.8	6	15.5	4	4.6	4.8	15.9	4.1
Block Island, R. I.....	8.9	5.6	10.7	4.6	5.2	4	16.9	3.7	4.1	3.8	16.7	4.2	6	4	17.6	3.2
Fire Island, N. Y.....	5	8	8.7	3.9	3.3	4.7	12.7	3.6	3.2	4.7	13.2	4.9	5.3	5.5	12.5	2.1
Sandy Hook light-ship, N. Y.....	6.4	10.4	4.9	7	3.6	11	7.1	6.7	3.5	9.5	8.3	8.1	6.6	8.3	7.3	7
Absecon Inlet, N. J.....	10.3	11.2	4.8	4.5	7.9	12.1	6.3	3.5	8.5	10	7.5	4.6	9.8	9.4	6.9	4.6
Five-Fathom Bank, N. J.....	9	6	10	5	6	7	12.9	3.1	5.5	5.5	14.1	4.2	9.3	5.9	10.5	3.8
Winter Quarter Shoal, Va.....	11.6	5.6	10.8	1.9	7.5	9.3	9.6	1.8	5.5	5.1	14.1	2.8	12.2	5.4	9.5	2.2
Body's Island, N. C.....	14.1	5.5	9.1	2.3	10	5	11.5	1.5	9.8	5.7	13.1	1.9	14.7	7	7.9	1.2
Cape Lookout, N. C.....	12.7	5.2	10.5	1.6	9.2	5.4	13.9	.8	7.3	3.7	17.2	2.1	12.8	3.9	10.7	1.2
Frying Pan Shoals, N. C.....	8.5	4.1	8.7	2.8	9	3.3	15.2	1	5.8	1.5	21.1	.7	10.9	3.2	11.6	2.2
Rattlesnake Shoal, S. C.....	10.6	9	8.4	1.6	6.7	8.2	13	1.4	6.4	9	14.3	.8	10.9	8.1	9.3	1.6
Martin's Industry Shoal, S. C.....	11	9.9	7.1	2.4	7.8	10.6	9.4	1.5	7	7.8	13.5	1.4	10.5	7.5	8.6	2.6
Fowey Rocks, Fla.....	11.6	11.8	4.4	1.9	5.3	16.9	5.5	1.1	6.8	15.4	6.4	1.3	6.7	16.7	4.4	1.6
Carysfort Reef, Fla.....	11.6	10.1	6.4	2.8	8.8	17.1	3.2	.8	6.7	17.9	4.9	.9	9.1	17.2	2.3	1.9
Tortugas, Fla.....	14	8.2	2.4	5.2	9.6	15.6	2.2	2	11.4	10.8	5.2	2	12.8	9.4	3.6	4

* The northeast quadrant includes NNE. to E., inclusive; the southeast, ESE. to S., inclusive; the southwest, SSW. to W., inclusive; the northwest, WNW. to N., inclusive. In the columns of figures, each one-tenth of a unit represents one observation, and each unit ten observations extending through five years, the latter being equivalent to one day's observations for five years. The time ratio for each quadrant is, therefore, represented by days and fractions of a day.



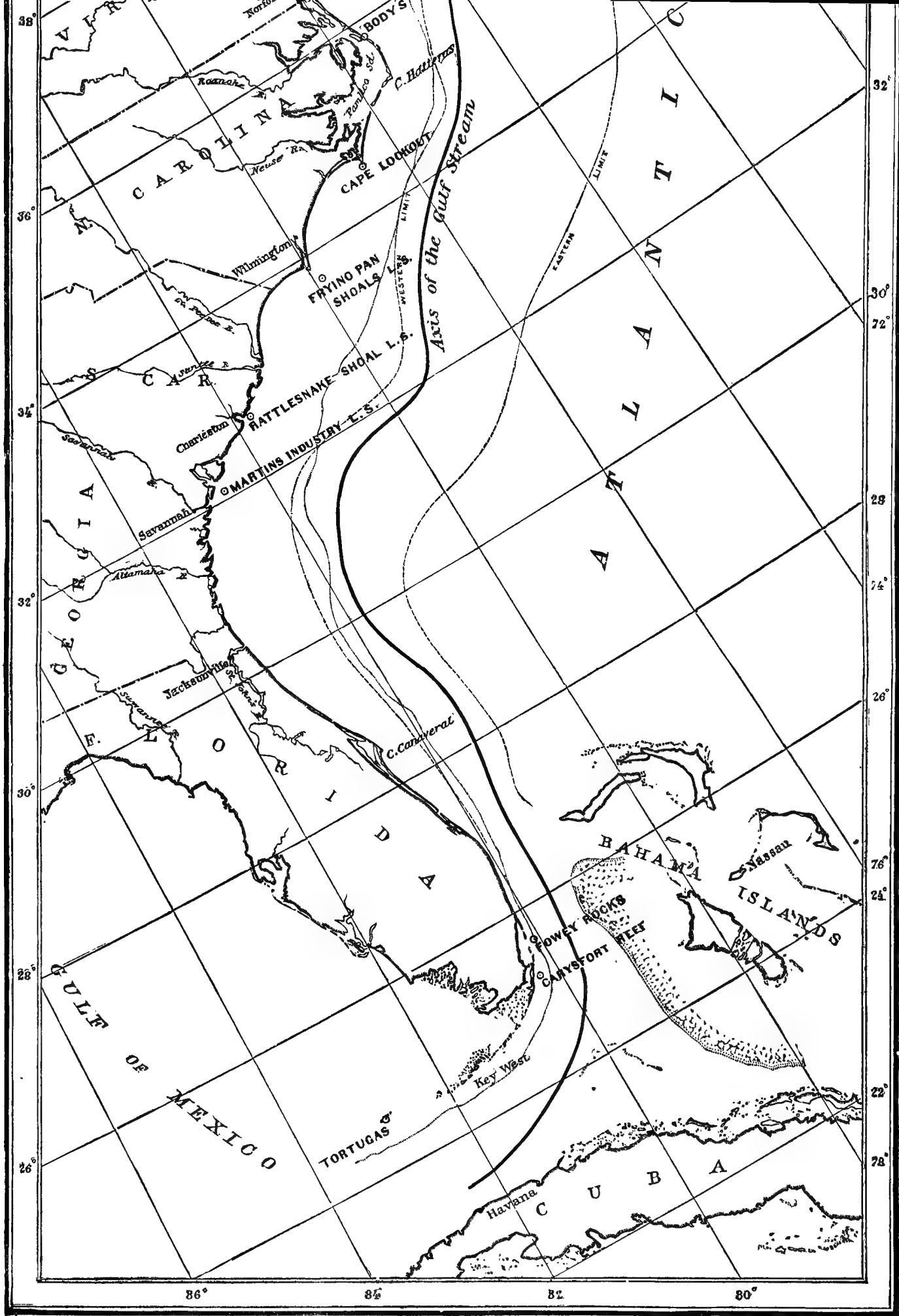


Table showing the direction of the winds, by quadrants, for each month of the year, &c.—Continued.

Stations.	September.				October.				November.				December.			
	NE.	SE.	SW.	NW.	NE.	SE.	SW.	NW.	NE.	SE.	SW.	NW.	NE.	SE.	SW.	NW.
Petit Manan, Me	5.5	9.2	10.9	4.3	5.6	8.9	7.4	9.1	6.4	6.3	9.6	7.7	4.3	7.2	7.9	11.6
Mt. Desert Rock, Me	5.5	6.9	10.6	4.1	5.7	7.1	9.8	6.6	6.8	5.7	9.7	7.5	5.3	7.1	8.7	9.6
Martinicus Rock, Me	5.7	6	10.2	5.1	6.1	5.8	10	8.6	6.1	3.7	10.3	9.7	4.5	5.5	8.2	12.3
Seguin Island, Me	7.9	4.7	11.8	4.4	8.6	4.5	11.4	6.1	8.4	1.8	10.1	9	7	2.9	10.7	9.7
Boon Island, Me	10	10.1	6	3.1	11.4	7.3	7.7	4.2	9.7	4.3	9.1	6.8	8.8	4	9.6	8.6
Pollock Rip, Mass	9.4	6.2	8.5	4.5	10.8	4.7	8.3	5.9	6.8	3.1	9.1	10	5.1	4.4	10	10.3
Nantucket N. S. Shoal	10.1	5.3	11.3	3.5	9.3	5.2	9.4	7.6	6.1	2.9	7.2	11.9	4.7	4.6	7.2	13.8
Vineyard Sound light ship, Mass	9.3	4.5	11.3	4.1	10.2	4.1	9.4	6.5	6	1.9	11.1	10.2	5.5	2.3	9.3	13.8
Brenton's Reef, R. I.	6	6.3	10.9	4.7	8.1	4.8	9.7	7.1	4.7	2	11	11.6	4.9	2.9	9.4	13.2
Block Island, R. I.	9.8	5	11.3	3.9	10.9	4.1	12.1	3.9	5.4	2.7	9.9	9.8	7	2.2	9.7	9.9
Fire Island, N. Y.	5.9	4.7	11.5	3.5	7	4.9	7.7	6.9	5.4	1.9	8.3	9.8	7.4	1.8	8.8	8.4
Sandy Hook light-ship, N. Y.	7.6	8.8	6.8	5.7	8.6	6.4	5.7	9.5	6	3.9	6.1	13.6	6.5	3.7	5.8	14.6
Absecon Inlet, N. J.	10.3	8.2	6.9	4.5	8.6	7.1	6.2	8.7	4.4	4.2	8.9	12.1	3.8	3.9	9.4	13.8
Five-Fathom Bank, N. J.	9.4	4.6	11.7	3.8	9	4.2	8.6	7.9	6.3	2.1	9	12.1	4.2	3.2	9.7	12.7
Winter Quarter Shoal, Va.	10.6	5.1	10.5	2.8	12	5.3	7.8	4.8	7.5	2.3	9.9	9.8	6.1	4	9.8	9.5
Body's Island, N. C.	15.4	6.7	6.8	1.1	15.9	5	6.2	3.8	8.6	4.4	7.3	9.7	7.5	5.3	9.3	8.6
Cape Lookout, N. C.	13.2	6.1	6.5	2.3	13.6	4.2	5.9	6.1	10.2	3.7	4.5	8.9	10.2	4.3	6.6	7.7
Frying Pan Shoals, N. C.	13.5	5.1	6.1	1.5	16	4	5.7	3.9	12.5	3.5	4.3	8.3	12	3.2	7.2	7.9
Rattlesnake Shoal, S. C.	13.1	10.2	3	2.4	17.7	4.9	4.9	2.7	13.9	4.6	4.6	5.8	11.9	2.4	8.4	5
Martin's Industry Shoal, S. C.	15.1	7.1	3.7	3.3	17.8	4.5	4.2	3.8	13.8	3.1	3.9	8.1	10.7	4.1	7.8	6.3
Fowey Rocks, Fla.	13.5	9.7	4.4	1.5	17.3	5.7	2.8	4.5	15	7.1	1.4	5.9	12.2	9.2	2.1	6.9
Carysfort Reef, Fla.	15.1	8.9	3.6	1.3	16.1	8.1	3.2	3.6	13.7	7.4	2.3	6.4	10.5	11	.7	8.7
Tortugas, Fla.	14	10.2	4	1.6	23.2	2.2	2.4	3	21.2	2	.4	6	20	3.8	.2	6.8

EXPLANATION OF OCEAN TEMPERATURE CHART No. 2.

DRY TORTUGAS LIGHT-HOUSE, FLORIDA.

Observer: ROBERT H. THOMPSON.

Location of station.—The Dry Tortugas light-house is built on Loggerhead Key, the westernmost island of the Tortugas Reefs. These reefs are a westerly extension of the Florida Reefs, and are located about 1 degree from Key West. Loggerhead Key is about three-fourths of a mile long, and less than one-fifth as wide. It is situated on the southeasterly side of an elongate bank, bearing the same name, and trending in a northeasterly and southwesterly direction. The bank is about 5 miles long, and has an average width of three-fourths of a mile, inside of the 3-fathom line. The Southwest Channel, with depths of 10 to 12 fathoms, separates Loggerhead Bank from the Bird, Garden, and Long Key Bank on the east. Strong tidal currents set through it, running northeast on the flood and southwest on the ebb. The channel between the Tortugas and Cuba is about 90 miles wide and is occupied by the Gulf Stream, the axis of which approaches much nearer the Cuban coast than the Tortugas. The depth of water in this channel exceeds 1,000 fathoms in some places, being greatest in its southern part. The 10-fathom curve passes close by the eastern side of Loggerhead Key, and the 100-fathom curve is distant only about 20 miles to the southward.

Geographical position of the light-house.—Latitude, $24^{\circ} 38' 04''$ N.; longitude, $82^{\circ} 55' 42''$ W.

Depth of water.—The depth of water where the observations were taken is 5 feet at mean low tide.

Range of temperature.—Air, $21^{\circ}.5$ (67° to $88^{\circ}.5$); surface, $20^{\circ}.5$ ($65^{\circ}.5$ to 86°).

The depth of water where the observations were taken is probably too little, and the locality too much sheltered to afford satisfactory results respecting the temperature of the open waters surrounding the Keys. That such is the case will appear evident on comparing the temperature chart for the Tortugas with those for Carysfort Reef and Fowey Rocks. On the first mentioned, the more direct influence of the air upon the water temperature is made apparent by the manner in which each fluctuation in the curves of air temperature is repeated in the curves of water temperature. At the two more northern stations, although the depths are no greater, the curves of water temperature present fewer angles, probably due to the more open exposure of the places of observation.

The range of temperature given above is for 1881, that year having afforded the greatest extremes in temperature of any plotted. There is comparatively little difference between the air and surface temperatures at any period, and great uniformity in the curves of surface temperature during the summer and early fall months of all the years excepting 1884, in which year both the air and surface temperatures were constantly from 3 to 10 degrees lower between April and the middle of October. The collateral observations fail to explain the cause of this variation, the records for direction and force of the winds showing that essentially the same conditions in those particulars prevailed during 1884 and 1885, though both of those years differed more or less from the three preceding ones.

Between March 21 and April 10, 1881, and between November 26 and December 6, 1882, the temperature of both the air and water fell far below that for the corresponding periods of other years, affording the lowest observations recorded. The cause of these extreme variations, which are so clearly brought out by the curves of temperature on the chart, may be explained by the fact that during those two periods the winds were almost constantly from the north and northwest, and blowing fresh; the prevailing winds for the months in question are generally northeasterly. Low temperatures were recorded during the same periods at Carysfort Reef and Fowey Rocks, the next stations to the north.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	14.9	15.1	13.4	11.6	14	9.6	11.4	12.8	14	23.2	21.2	20
Southeast	7.2	7	8.4	10.2	8.2	15.6	10.8	9.4	10.2	2.2	2	3.8
Southwest	2	1.1	2.2	1.8	2.4	2.2	5.2	3.6	2	2.4	.4	.2
Northwest	5.9	4.4	5.6	6	5.2	2	2	4	1.6	3	6	6.8

OCEAN TEMPERATURE CHART No. 2

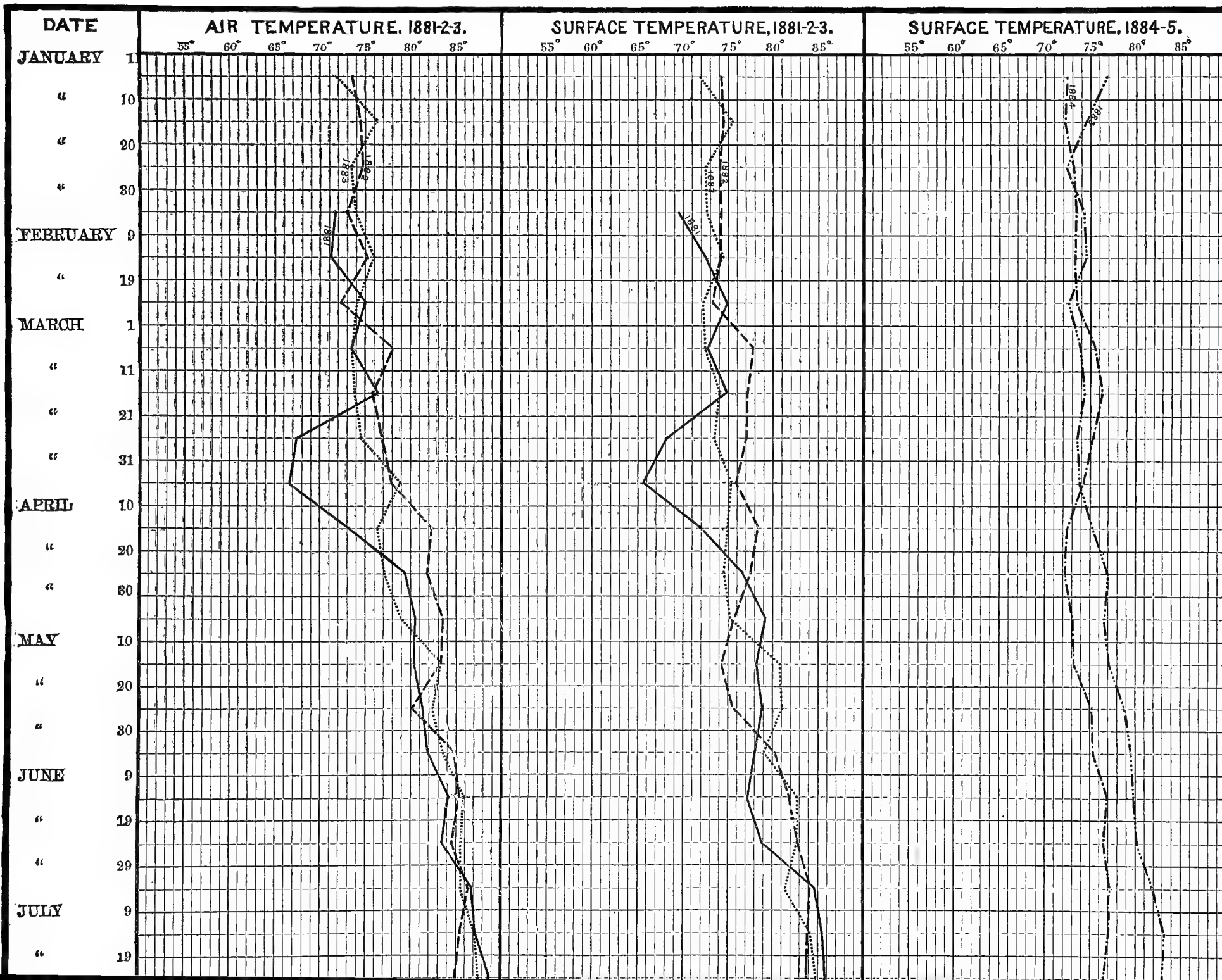
By RICHARD RATHBUN.

Station: Dry Tortugas Light House, Florida.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: — 1881, — — — 1882, 1883, — — — 1884, — — — 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 3.

CARYSFORT REEF LIGHT-HOUSE, FLORIDA.

Observers: EDWARD BELL, F. A. BROST, MARTIN WEATHERFORD.

Location of station.—Carysfort Reef light-house is located on the outer side of Carysfort Reef, in front of Key Largo, and facing the Straits of Florida. It is about 158 miles northeasterly from the Dry Tortugas light-house. The water deepens rapidly from the outer edge of the reef, attaining a depth of 50 fathoms within a distance of about 2 miles. The 100-fathom curve is distant about 7 miles, and the axis of the Gulf Stream about 27 miles.

Geographical position.—Latitude, 25° 13' 15" N.; longitude, 80° 12' 42" W.

Depth of water.—Three feet.

Range of temperature.—Air, 18° 5 (65° 5 to 84°); surface, 15° (71° 5 to 86° 5).

The temperature is more equable at this station than at the Tortugas, both as regards the air and water. The air temperature is relatively lower throughout the year, the maximum being 4½° lower at Carysfort than at the Tortugas. The curves of surface temperature are more regular, and are very uniform for all the years, apparently indicating that the place at which the observations were taken was well suited for the purpose, although the depth of water was only 3 feet. The maximum surface temperature was practically the same at this station as at the Tortugas, and exceeds the air maximum by 2° 5.

The low temperatures recorded at the Tortugas for March, 1881, and November 26 to December 6, 1882, were also observed at this station, though in a relatively less degree, especially as regards the former period. During the first part of March, 1881, northerly and northwesterly winds prevailed, while during the latter part of the same month the winds were variable. During the ten days ending December 6, 1882, they were mostly from the north and northeast.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	8.4	11	8.6	8.2	11.6	8.8	6.7	9.1	15.1	16.1	13.7	10.3
Southeast	15	7	11.9	12.8	10.1	17.1	17.9	17.2	8.9	8.1	7.4	11
Southwest	2.6	2.2	4.5	3.6	6.4	3.2	4.9	2.3	3.6	3.2	2.3	.7
Northwest	4.8	8	5.4	5.4	2.8	.8	.9	1.9	1.3	3.6	6.4	8.7

OCEAN TEMPERATURE CHART No. 3

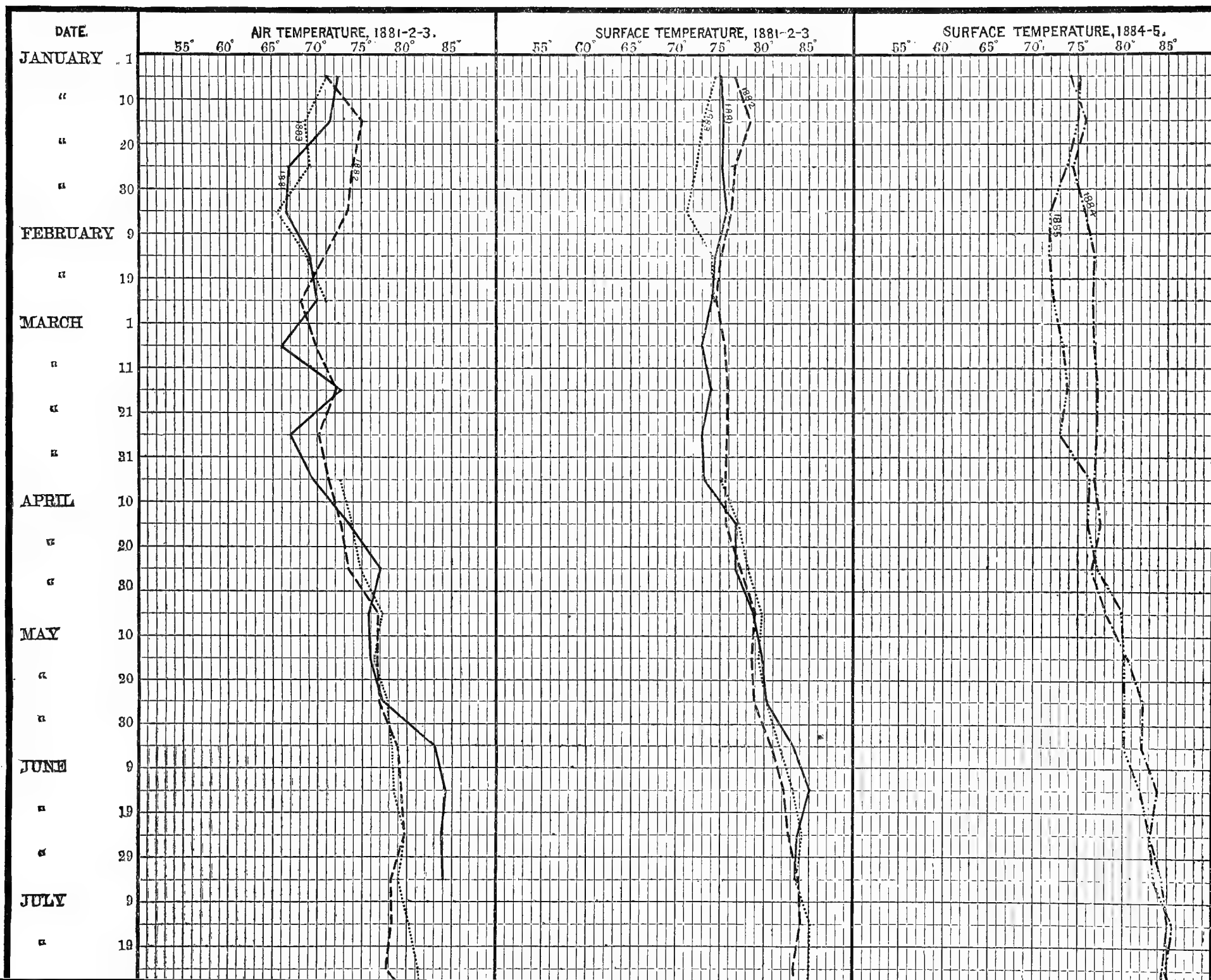
By RICHARD RATHBUN.

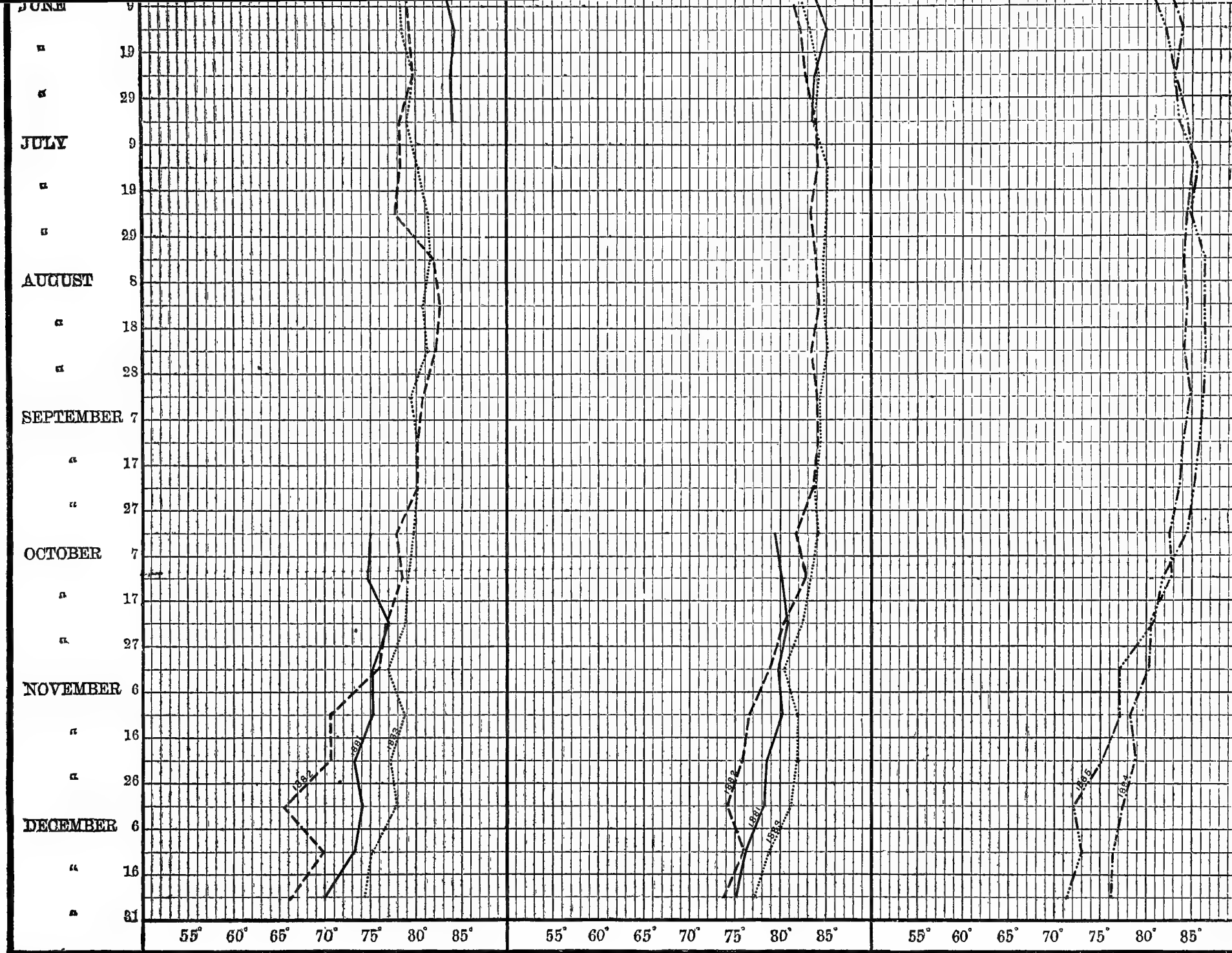
Station: Carysfort Reef Light House, Florida.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, - - - 1882, 1883, — — — 1884, — — — 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 4.

FOWEY ROCKS LIGHT-HOUSE, FLORIDA.

Observer: JOHN J. LARNER.

Position.—Fowey Rocks light-house is built on Fowey Rocks, which are located very near the northeastern extremity of the Florida Reefs, about 6 miles southeasterly from Cape Florida, and 23 miles northerly from Carysfort Reef. These rocks are on the western side of the Straits of Florida, in their northern and narrowest portion, sometimes called the Straits of Bemini, the eastern border of which is formed by the northwestern extremity of the Great Bahama Bank. The light-house is situated on the outer edge of the rocks, which lie directly in front of the widest opening to Key Biscayne Bay. Depths of 7 to 16 fathoms occur close to the light; the 100-fathom line is distant only about $2\frac{1}{2}$ miles, and the axis of the Gulf Stream about 24 miles.

Geographical position.—Latitude, $25^{\circ} 35' 25''$ N.; longitude, $80^{\circ} 05' 41''$ W.

Depth of water.—Five feet.

Range of temperature.—Air, 18° (68° to 86°); surface, $16^{\circ}.5$ (70° to $86^{\circ}.5$).

There is comparatively little difference between the temperatures at Fowey Rocks and Carysfort Reef, these two stations, located only 23 miles apart, being more closely related than are either of them to the Tortugas. The air temperatures range slightly higher at this station than at Carysfort, but the surface curves correspond very closely throughout each year, the greatest difference at any period being only 2° or 3° . The more prominent irregularities in the surface curves at one station are almost invariably repeated in those of the other at the same period. The angles indicating low temperatures for March, 1881, are more pronounced here than at Carysfort, but those for the last part of 1882 are less marked. The maximum air and surface temperatures at this station are very nearly identical.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	11.6	9.1	8.9	9	11.6	5.3	6.8	6.7	13.5	17.3	15	12.2
Southeast	13.1	10.3	10.5	12.1	11.8	16.9	15.4	16.7	9.7	5.7	7.1	9.2
Southwest	2.9	2.3	4.2	4.5	4.4	5.5	6.4	4.4	4.4	2.8	1.4	2.1
Northwest	3.3	5.9	6.8	3.7	1.9	1.1	1.3	1.6	1.5	4.5	5.9	6.9

OCEAN TEMPERATURE CHART No. 4

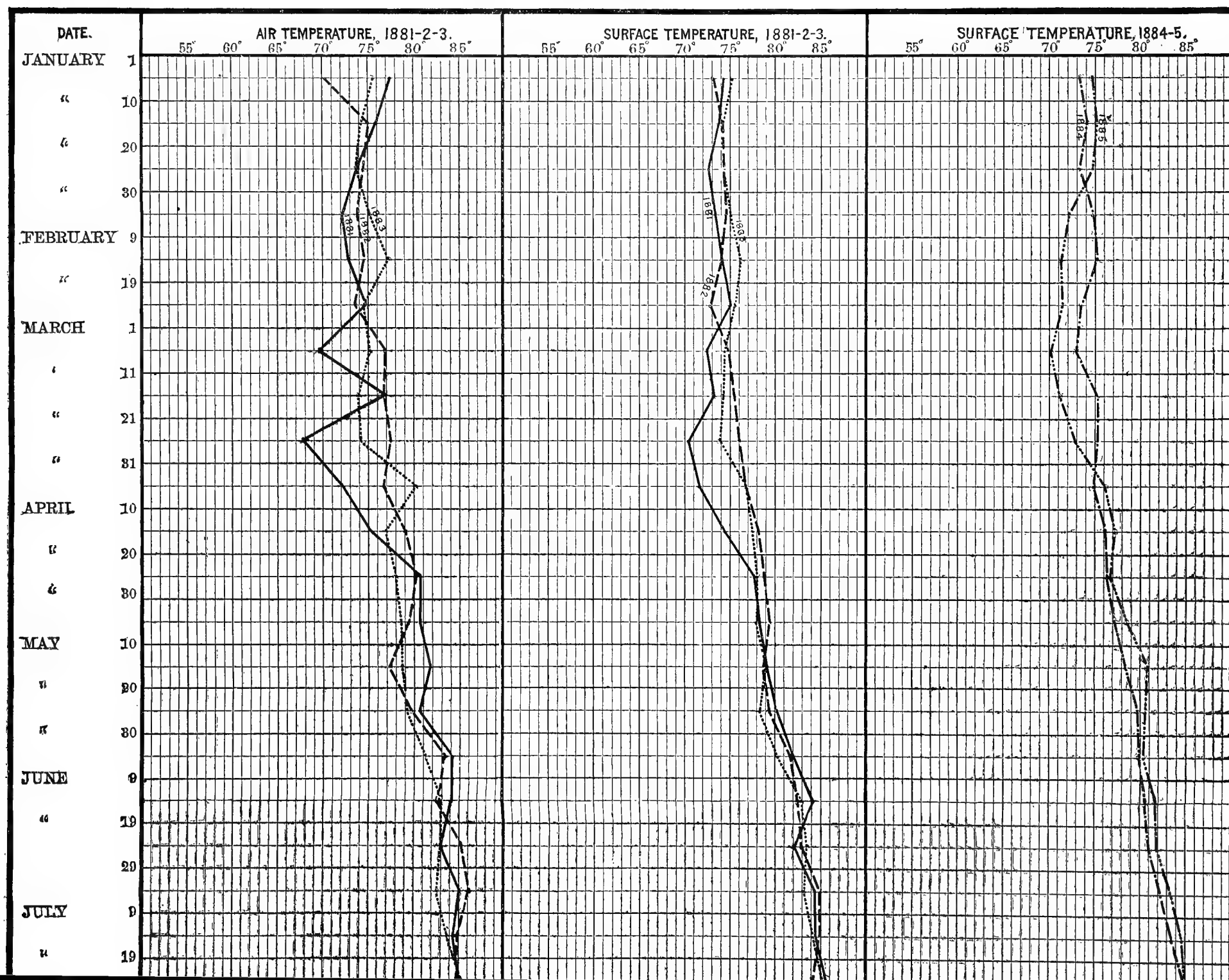
By RICHARD RATHBUN.

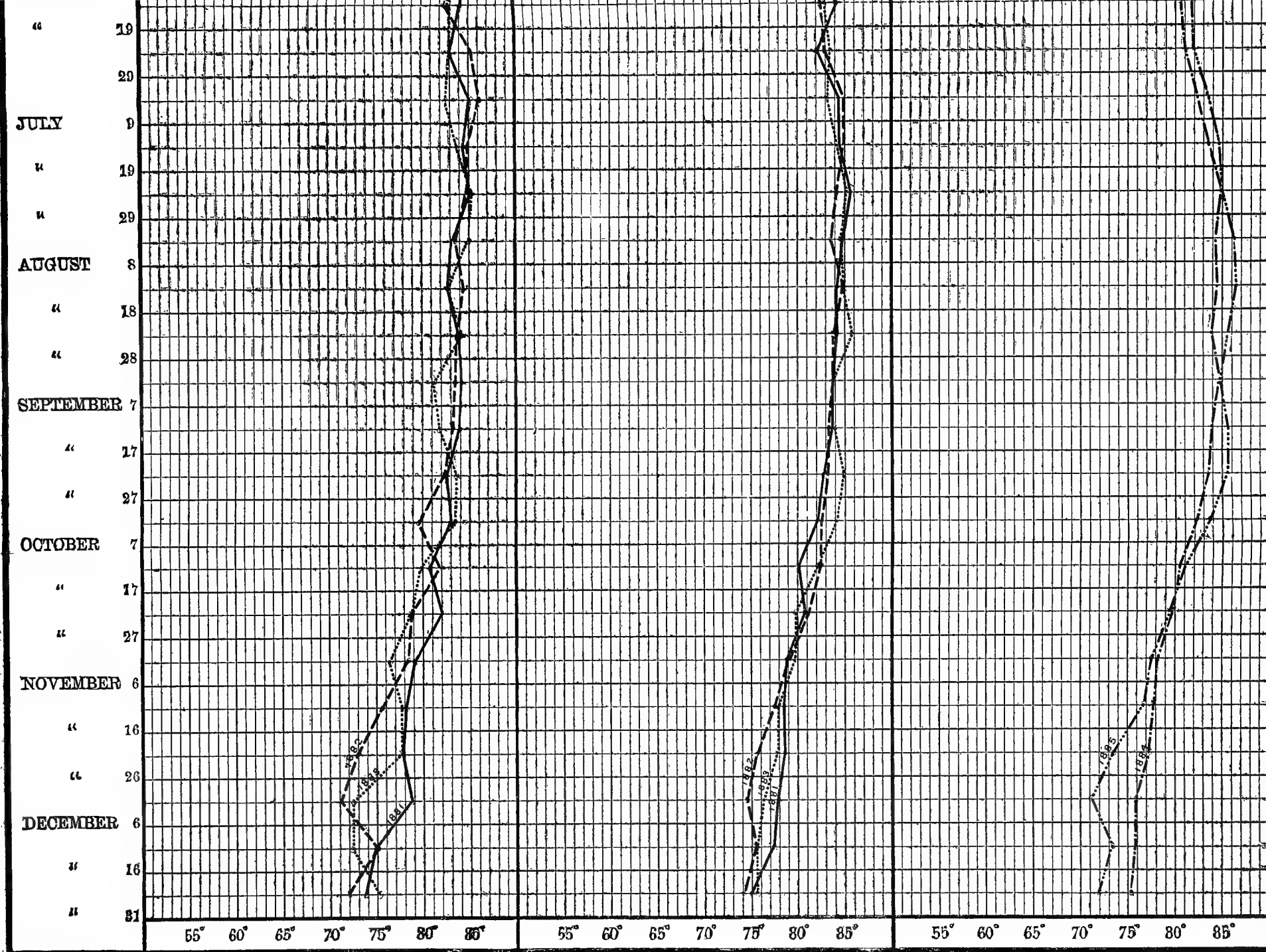
Station: Fowey Rocks Light House, Florida.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, — — — 1882, 1883, — — — 1884, — — — 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 5.

MARTIN'S INDUSTRY LIGHT-SHIP, SOUTH CAROLINA.

Observer: JOHN MASSON.

Position.—This light-ship is located off the entrance to Port Royal Sound, South Carolina, and about 390 miles northerly from Fowey Rocks, Florida. It is anchored about $8\frac{1}{2}$ miles from land, directly in front of Martin's Industry Shoal, from the outer edge of which it is distant a little more than a mile, the depths between ranging from $6\frac{1}{2}$ to 8 fathoms. The 10-fathom curve is distant about 9 miles, the 20-fathom curve about 32 miles, and the 100-fathom curve about 62 miles.

Geographical position.—Latitude, $32^{\circ} 05' (31'')$ N.; longitude, $80^{\circ} 35' (07'')$ W.

Depth of water.—Nine fathoms.

Range of temperature.—Air, $41^{\circ}.5$ (45° to $86^{\circ}.5$); surface, 33° (47° to 85°).

The conditions influencing the temperature at Martin's Industry Shoal are very different from those prevailing at the Florida Reef stations. The range of temperature is very much greater, and the temperature plottings on the chart form much more pronounced curves. The surface curves, although more regular than those for the air, are nearly parallel with them throughout each year, and the difference between the surface and air temperatures are seldom great. The maximum and minimum temperatures are nearly the same for both the air and surface, the latter having a slightly smaller range than the former. The maximum temperatures are about the same here as at Fowey Rocks, and Carysfort Reef, but the minimums are over 20° lower.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	Febr- ary.	March.	April.	May.	June.	July.	August.	Septem- ber.	October.	Novem- ber.	Decem- ber.
Northeast	12	10.3	7.6	9.8	11	7.8	-7	10.5	15.1	17.8	13.8	10.7
Southeast.....	4.4	5.5	7.1	7.8	9.9	10.6	7.8	7.5	7.1	4.5	8.1	4.1
Southwest.....	6.9	6.2	10.3	7.1	7.1	9.4	13.5	8.6	3.7	4.2	3.9	7.8
Northwest.....	5.2	3.9	5.5	4.4	2.4	1.5	1.4	2.6	3.3	3.8	8.1	6.3

OCEAN TEMPERATURE CHART No. 5

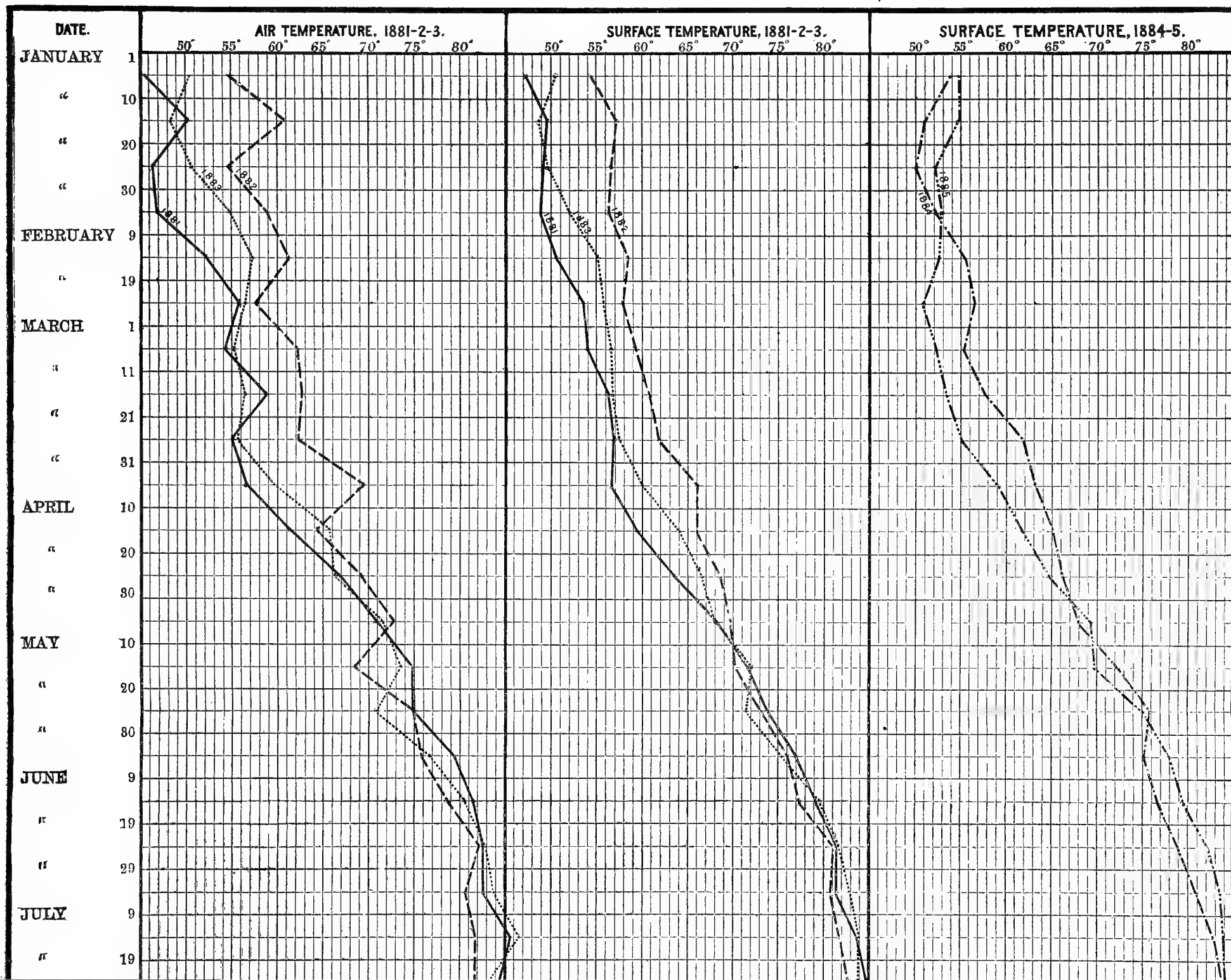
By RICHARD RATHBUN.

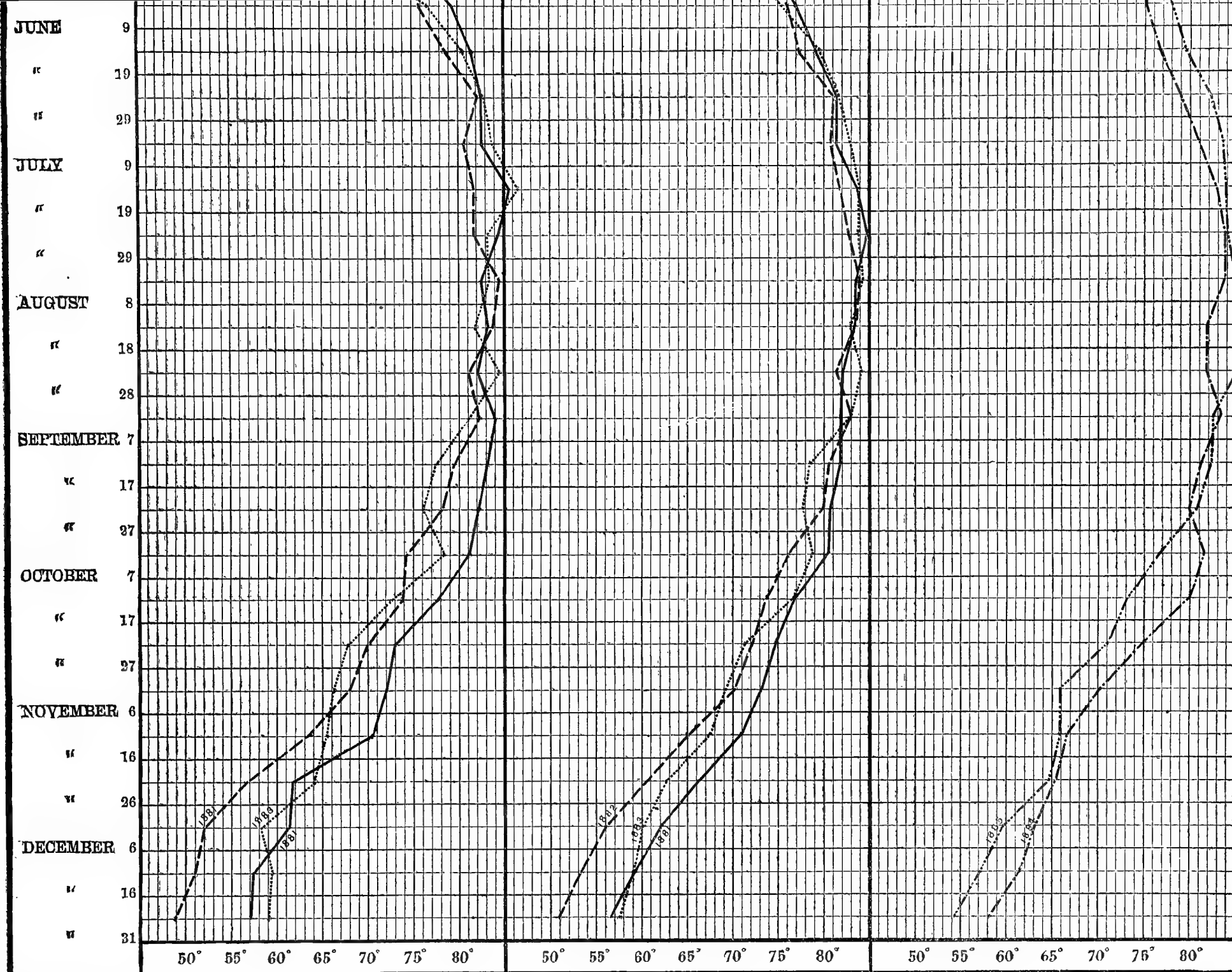
Station: Martin's Industry Shoal Light Ship, South Carolina.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, - - - 1882, 1883, — — — 1884, — — — 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882, and 1883; the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 6.

RATTLESNAKE SHOAL LIGHT-SHIP, SOUTH CAROLINA.

Observer : JOHN McCORMICK.

Position.—Rattlesnake Shoal light-ship is placed just north of the entrance to Charleston Harbor, South Carolina, and about 56 miles northeasterly from Martin's Industry light-ship. It is anchored about 5 miles off shore, and 2 miles off the shoals of the same name, between which and the light-ship there are depths of 4 to 5 fathoms. The 10-fathom curve is distant about 11 miles, the 20-fathom curve about 30 miles, and the 100-fathom curve about 50 miles.

Geographical position.—Latitude, $32^{\circ} 44' (00'')$ N. ; longitude, $79^{\circ} 43' (40'')$ W.

Depth of water.—Five fathoms.

Range of temperature.—Air, 41° ($45^{\circ}.5$ to $86^{\circ}.5$) ; surface, 38° (47° to 85°).

The range of temperature at this station is almost precisely the same as at Martin's Industry, there being a difference of only half a degree in the air records. The curves as plotted also agree closely at the two stations, both as regards their general features and their details.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	12.1	11.1	7	9.9	10.6	6.7	6.4	10.9	13.1	17.7	13.9	11.9
Southeast	3	5.8	5.8	6.9	9	8.2	9	8.1	10.2	4.9	4.6	3.4
Southwest	8.5	6.6	13.3	10	8.4	13	14.3	9.3	3	4.9	4.6	8.4
Northwest	5.2	3.1	3.9	2.5	1.6	1.4	.8	1.6	2.4	2.7	5.8	5

OCEAN TEMPERATURE CHART No. 6

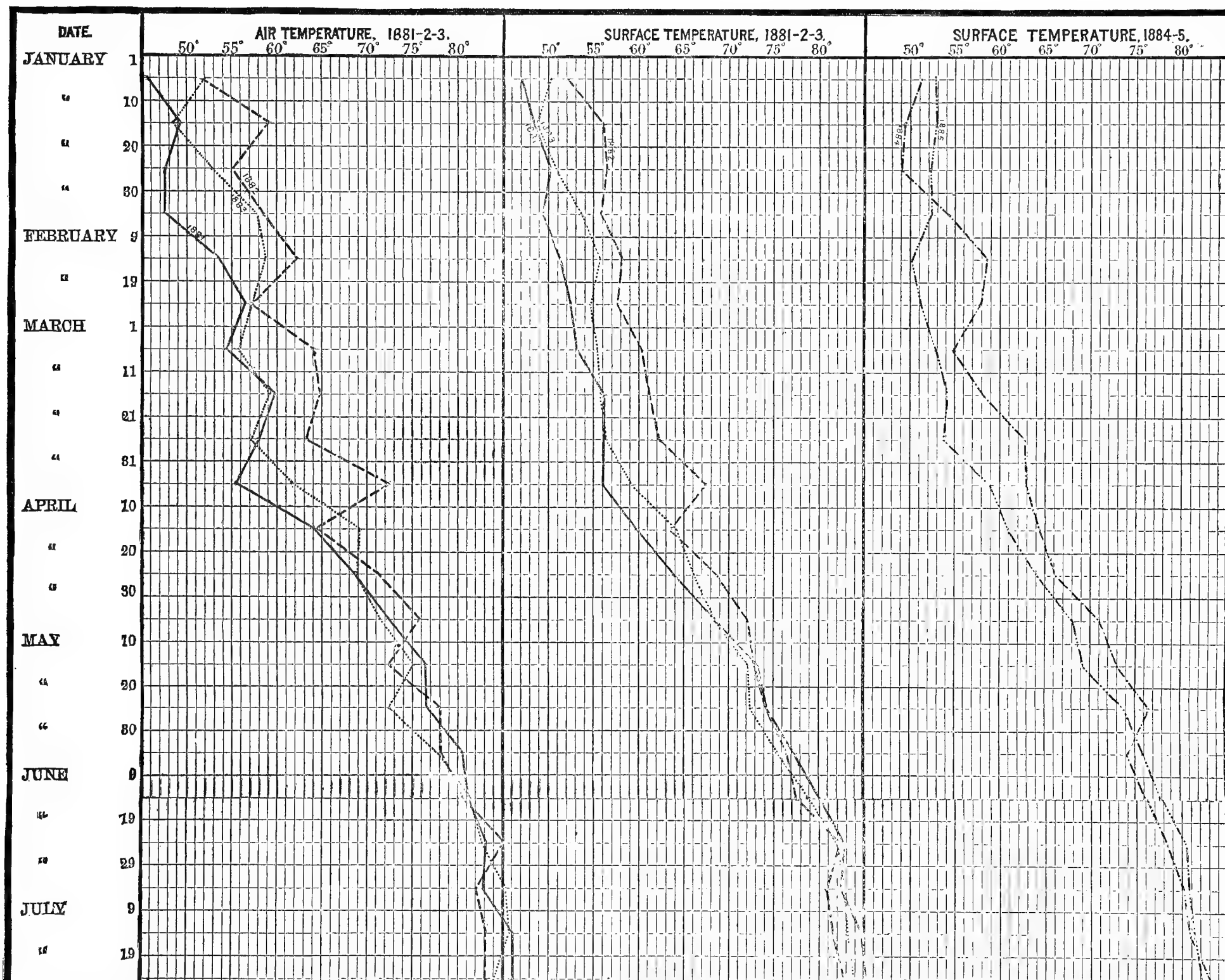
By RICHARD RATHBUN.

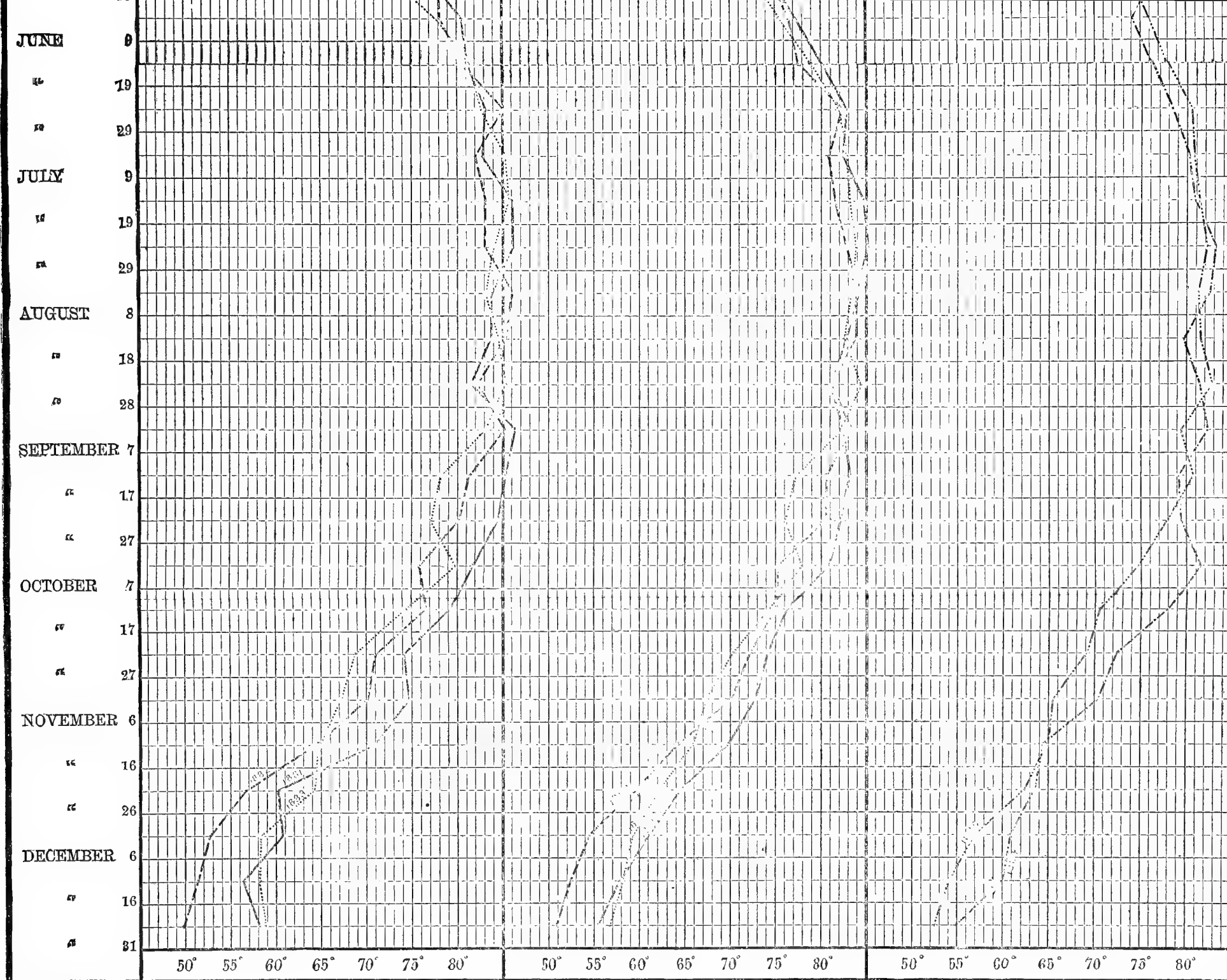
Station: Rattlesnake Shoal Light Ship, South Carolina.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, — — — 1882, — — — 1883, — — — 1884, — ···· — 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 7.

FRYING PAN SHOALS LIGHT-SHIP, NORTH CAROLINA.

Observers: D. W. MANSON, W. R. WALKER, J. H. DOSHER, J. D. DAVIS, G. D. WALKER, H. SWAN.

Position.—Frying Pan Shoals light-ship is located about $6\frac{1}{2}$ miles from the outer extremity of the main part of Frying Pan Shoals, about 17 miles southeasterly from Cape Fear, North Carolina, and about 108 miles northeasterly from Rattlesnake Shoal light-ship. Within a radius of 3 miles on all sides depths of $6\frac{1}{2}$ to 11 fathoms occur. The 20-fathom curve is distant 21 miles, the 100-fathom curve 36 miles.

Geographical position.—Latitude, $33^{\circ} 35' (00'')$ N.; longitude, $77^{\circ} 50' (04'')$ W.

Depth of water.—Ten to 11 fathoms.

Range of temperature.—Air, 41° (44° to 85°); surface, 33° ($49^{\circ}.5$ to $82^{\circ}.5$).

The curves of air temperature do not differ essentially from those of the two preceding stations; the range of temperature is precisely the same, although the maximum and minimum records are each $1\frac{1}{2}^{\circ}$ lower at this station. The surface temperatures, however, have a more limited range by 5° , reaching neither the same maximum nor minimum as at Rattlesnake Shoal.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	13.5	11.3	11	11.2	8.5	9	5.8	10.9	13.5	16	12.5	12
Southeast	2.2	4.5	2.5	2	4.1	3.3	1.5	3.2	5.1	4	3.5	3.2
Southwest	9.6	8.4	10.8	11.2	8.7	15.2	21.1	11.6	6.1	5.7	4.3	7.2
Northwest	5	3.9	5.7	3.9	2.8	1	.7	2.2	1.5	3.9	8.3	7.9

OCEAN TEMPERATURE CHART No. 7

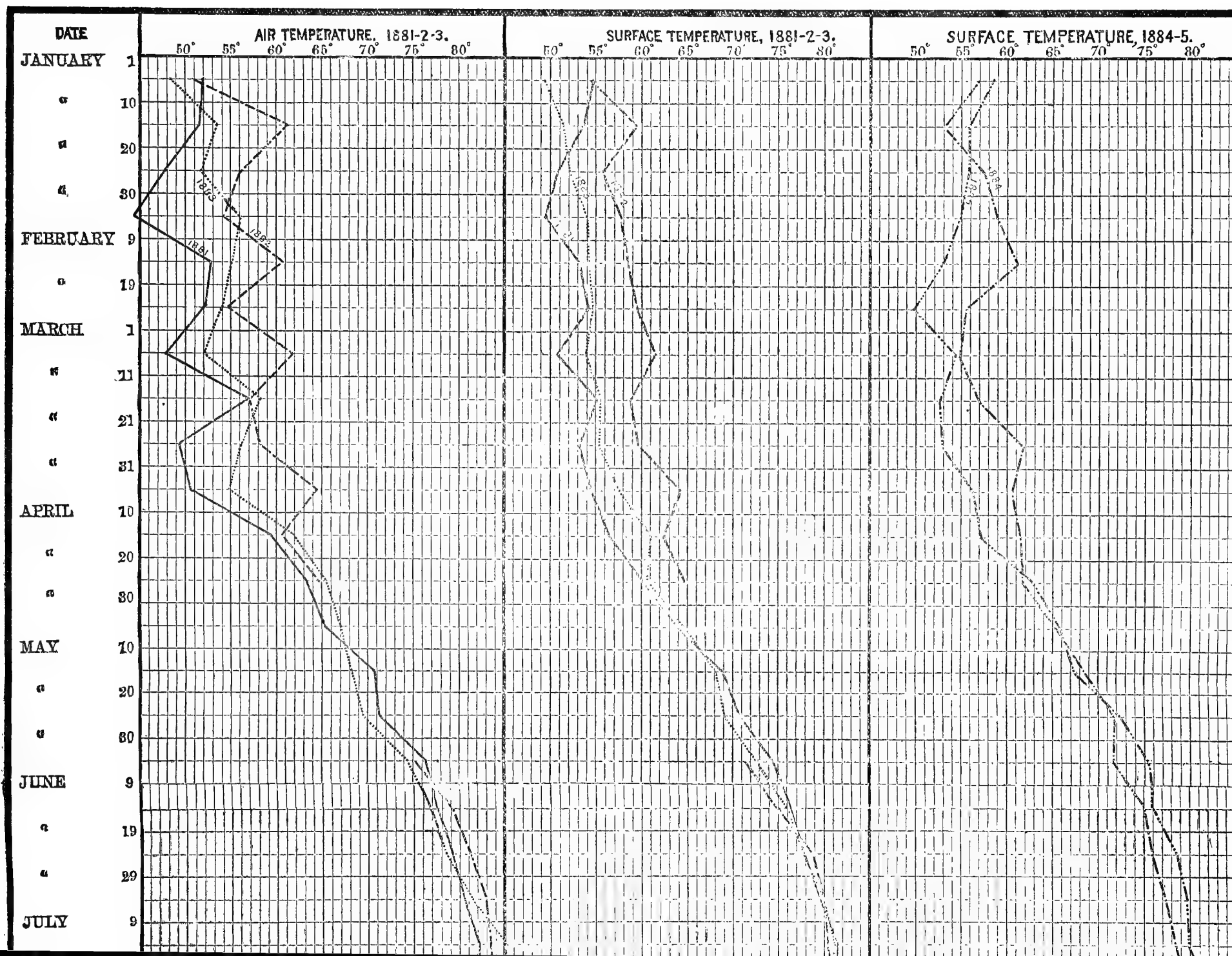
By RICHARD RATHBUN.

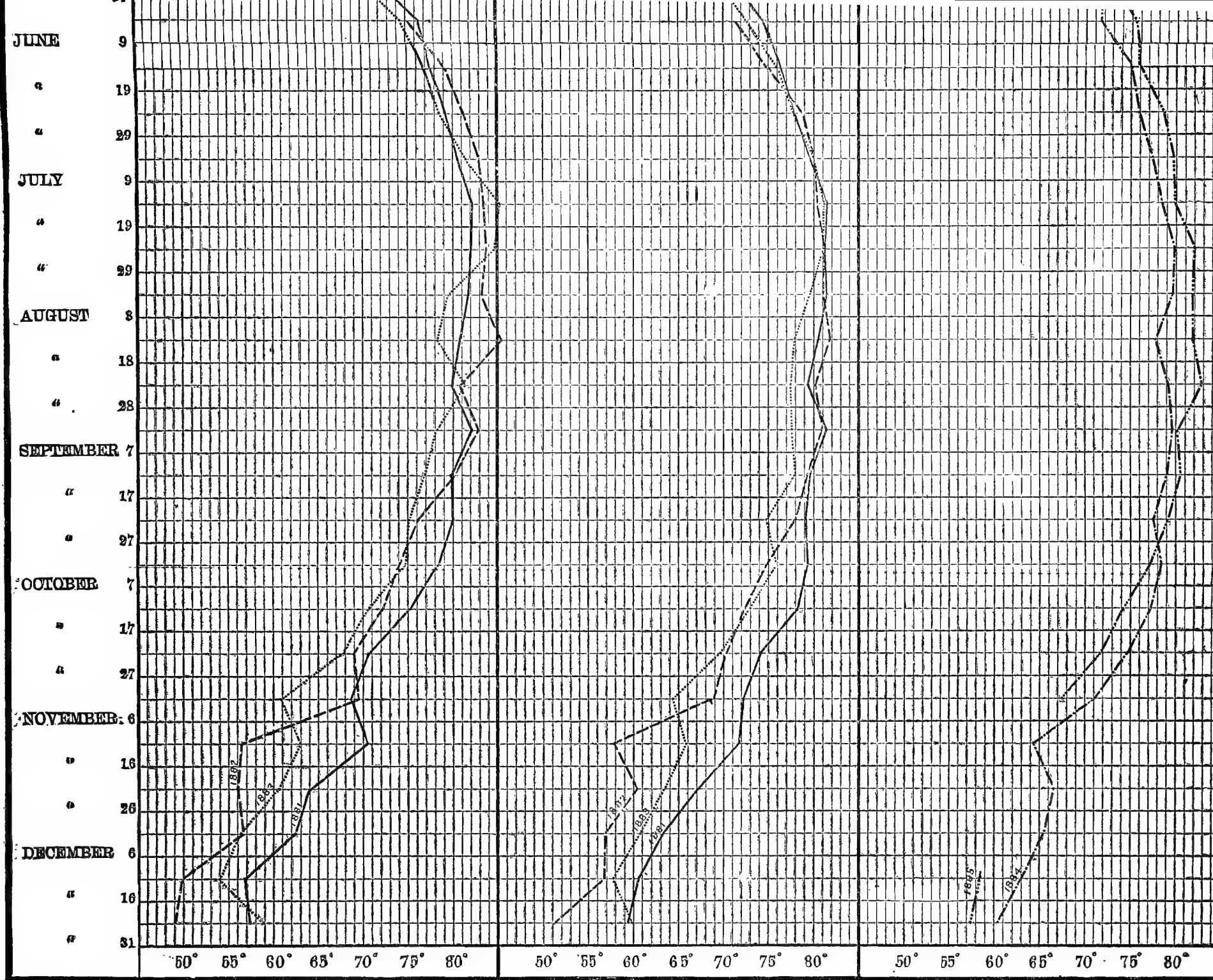
Station: Frying Pan Shoals Light Ship, North Carolina.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, — — — 1882, 1883, — · — 1884, — · · — 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 8.

CAPE LOOKOUT LIGHT-HOUSE, NORTH CAROLINA.

Observer: DENARD RUMLEY.

Location of station.—Cape Lookout light-house is situated on the easterly shore, facing the open ocean, about 3 miles north of the extremity of Cape Lookout, North Carolina, and is about 90 miles northeasterly from Frying Pan Shoals light-ship. The sandy shore slopes gradually for about half a mile before a depth of 3 fathoms is reached. The 10-fathom curve is distant about 5 miles, the 20-fathom curve 21 miles, and the 100-fathom curve 35 miles.

Geographical position.—Latitude, $34^{\circ} 37' (20'')$ N.; longitude, $76^{\circ} 31' (26'')$ W.

Depth of water.—One foot.

Range of temperature.—Air, 41° (43° to 84°); surface, 42° (42° to 84°).

The curves of air temperature correspond more or less closely with those of the three preceding stations; the range is precisely the same, and the maximum and minimum records are each but 1 degree lower than at Frying Pan Shoals. It will be observed, however, that the surface curves agree in nearly all their details with those of the air, having essentially the same range, and being much more irregular than at the three preceding light-ships. This is due to the fact that the observations were made in shallow water, close inshore, on a very gradually sloping beach.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	11.5	10.2	8.6	10.8	12.7	9.2	7.3	12.8	13.2	13.6	10.2	10.2
Southeast	2.9	2.7	3.9	3.2	5.2	5.4	3.7	3.9	6.1	4.2	3.7	4.3
Southwest	7.5	9	10	8	10.5	13.9	17.2	10.7	6.5	5.9	4.5	6.6
Northwest	7.7	4.6	6.8	4	1.6	.8	2.1	1.2	2.3	6.1	8.9	7.7

OCEAN TEMPERATURE CHART No. 8

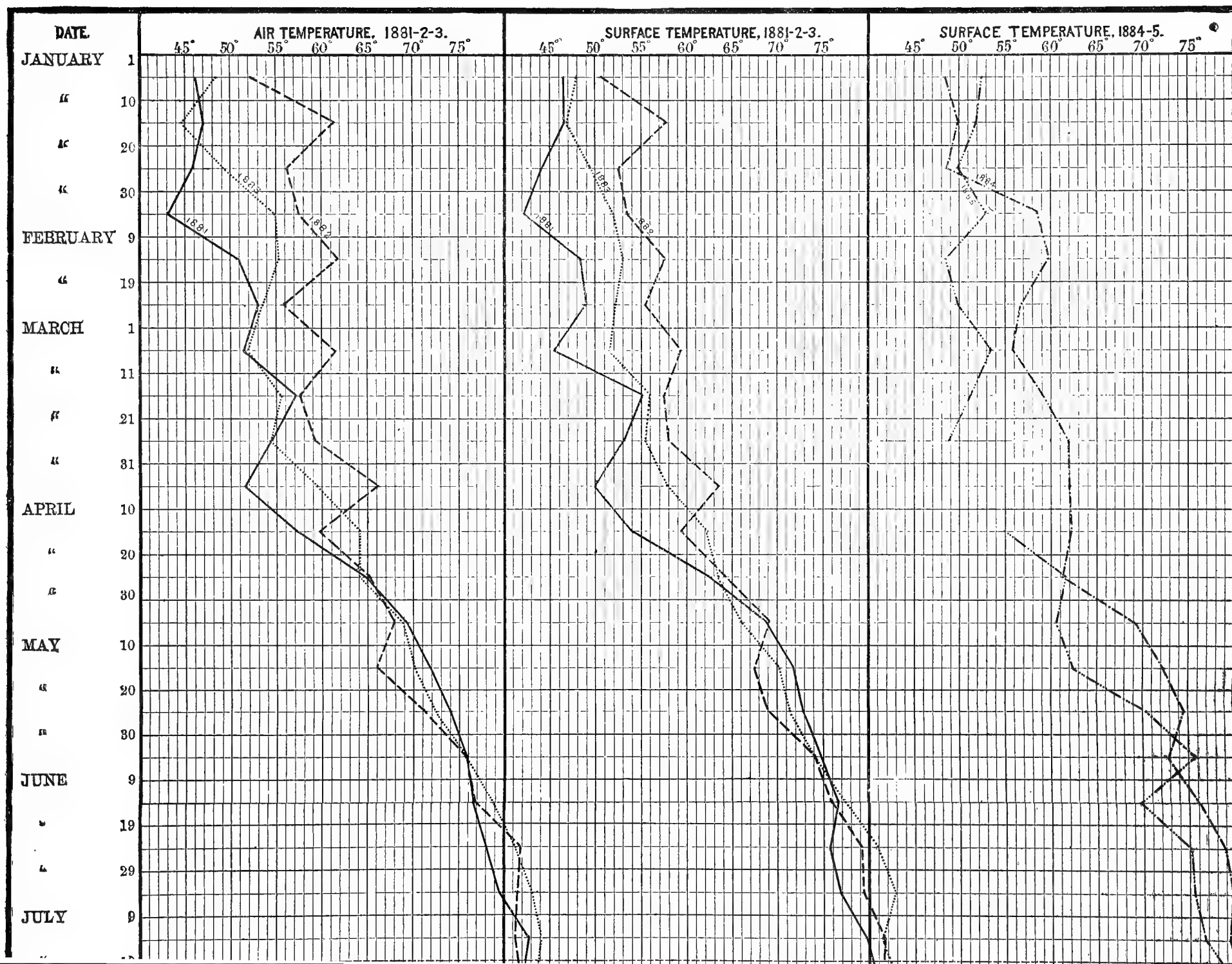
By RICHARD RATHBUN.

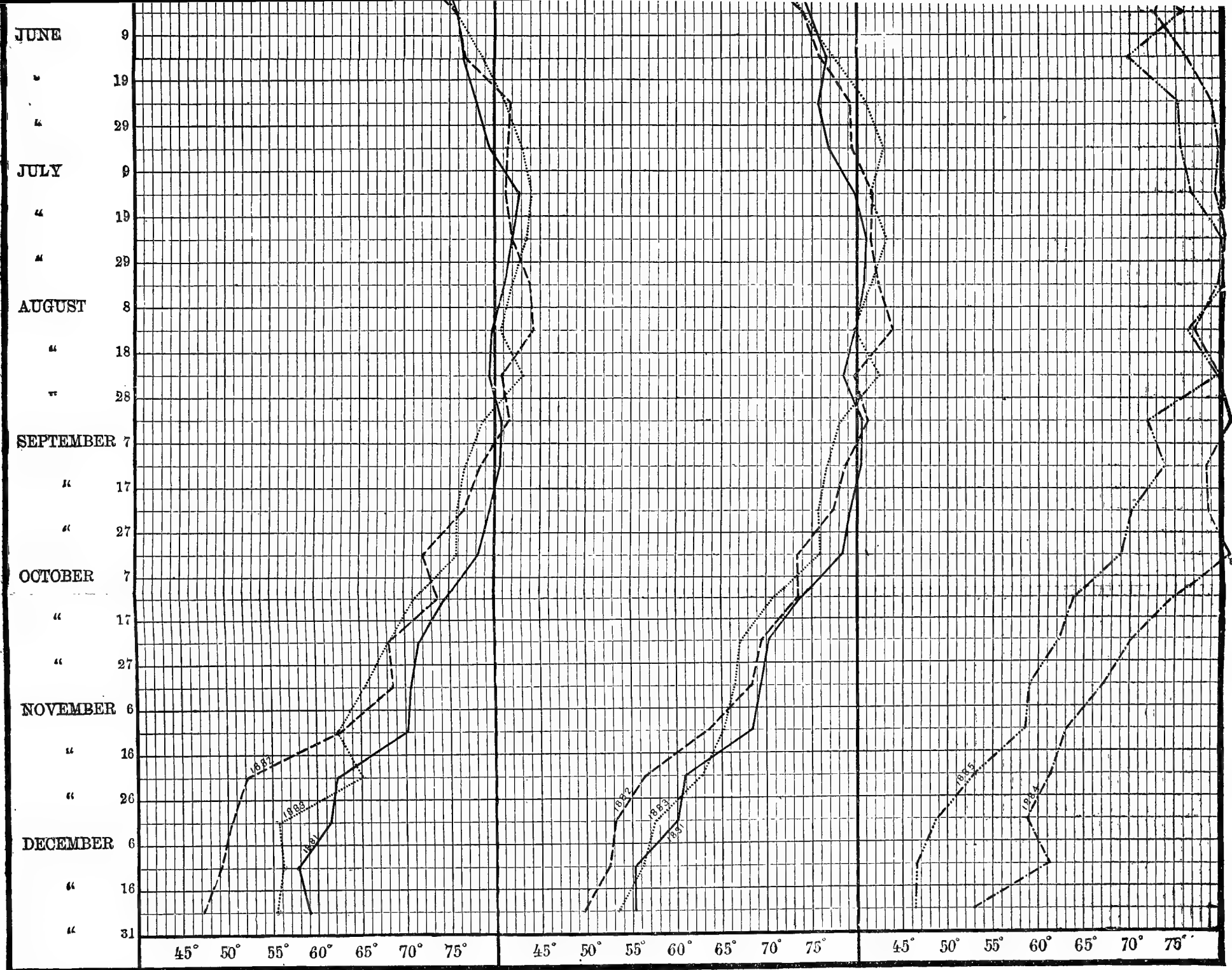
. Station: Cape Lookout Light House, North Carolina.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES. ——— 1881, — — — 1882, 1883, — — — 1884, — — — 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit; and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 9.

BODY'S ISLAND LIGHT-HOUSE, NORTH CAROLINA.

Observer: PETER G. GALLOP.

Location of station.—This light-house is situated near the southern end of Body's Island, north of Oregon Inlet, North Carolina, and is about $35\frac{1}{2}$ miles north of Cape Hatteras, and about 86 miles northeasterly from Cape Lookout. The shore is similar to that at Cape Lookout, sandy, and shelving very gradually so as to afford but slight depths of water near land. The 10-fathom curve is distant 2 miles, the 20-fathom curve 24 miles, and the 100-fathom curve 35 miles.

Geographical position.—Latitude, $35^{\circ} 49' 07''$ N.; longitude, $75^{\circ} 33' 49''$ W.

Depth of water.—Seven to 9 feet.

Range of temperature.—Air, 64° (27° to 91°); surface, 63° (28° to 91°).

The records for this station show an extraordinary range of temperature. The air and surface curves are almost precisely alike and indicate the same range of temperature for both air and surface, within 1° . The lowest surface temperatures recorded are probably the result of careless reading; the higher ones indicate that the observations were probably made in very shallow and quiet water, directly influenced by the sun's rays during the heat of summer.

The highest mean plotted, 91° , is $2\frac{1}{2}^{\circ}$ higher than the maximum for the air at the Tortugas, and 4° higher than the air maximum for any of the other stations to the south of Body's Island. The surface maximum also exceeds that of any of the more southern stations by $4\frac{1}{2}^{\circ}$.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of three years' observations.

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	8.4	8.2	9.6	12.9	14.1	10	9.8	14.7	15.4	15.9	8.6	7.5
Southeast	3.5	5.3	5.1	6	5.5	5.5	5.7	7	6.7	5	4.4	5.3
Southwest	10	6.4	8.9	6.7	9.1	11.5	13.1	7.9	6.8	6.2	7.3	9.3
Northwest	9.1	7.5	7.4	5.2	2.3	1.5	1.9	1.2	1.1	3.8	9.7	8.6

OCEAN TEMPERATURE CHART No. 9

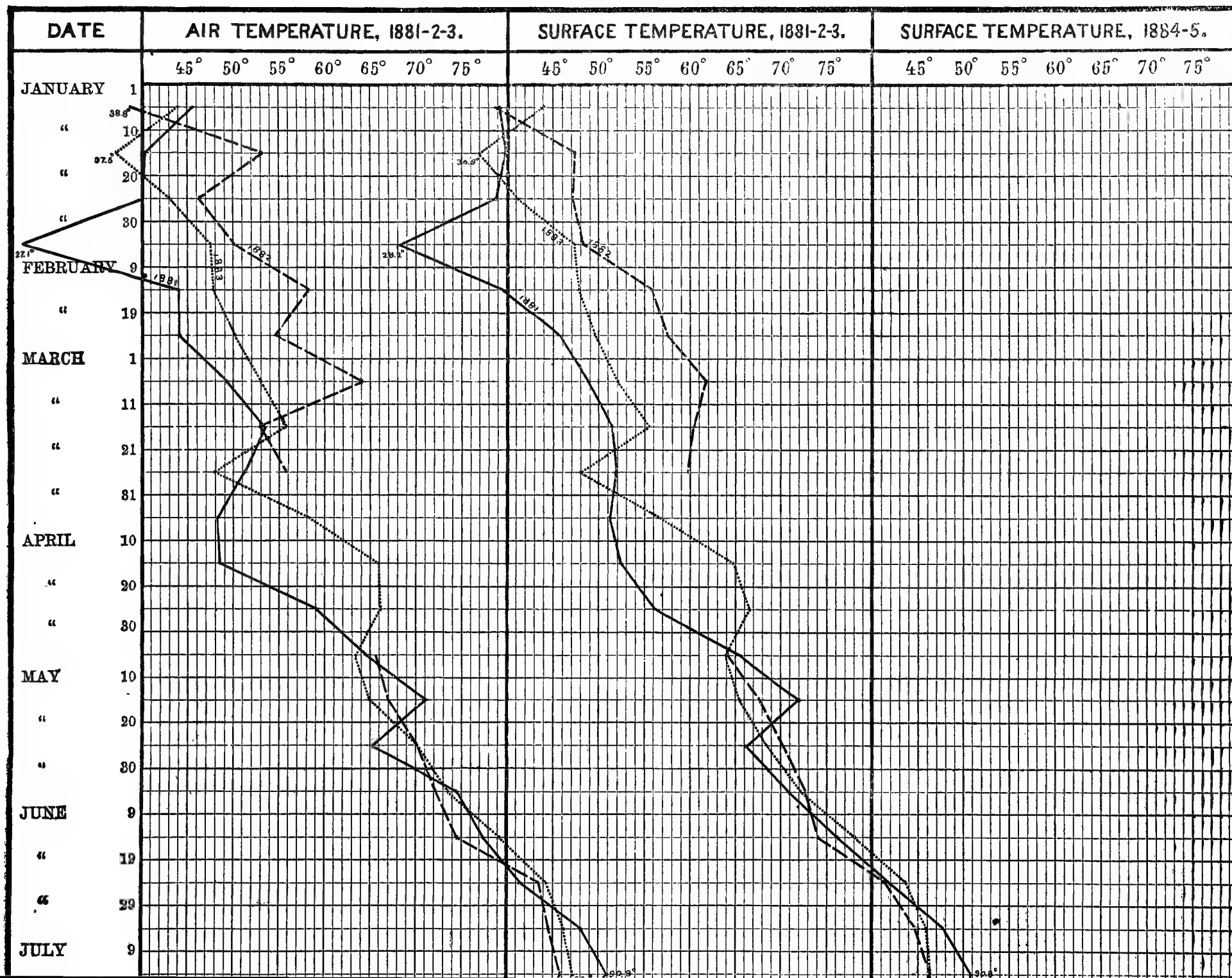
By RICHARD RATHBUN.

Station: Body's Island Light House, North Carolina..

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1883, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, - - - 1882, 1883, ——— 1884, ——— 1885.

(ISSUED IN 1886.)



EXPLANATION OF OCEAN TEMPERATURE CHART No. 10.

WINTER-QUARTER SHOAL LIGHT-SHIP, VIRGINIA.

Observer: C. LINDEMANN.

Location of station.—This light-ship is anchored 2 miles SE. by E. $\frac{1}{2}$ E. from Winter-Quarter Shoal, and $8\frac{1}{2}$ miles off Assateague Island, on the coast of Virginia. It is about midway between Chesapeake Bay and Delaware Bay entrances, and about 128 miles north of Body's Island light. Between the light-ship and the mainland depths of 4 to 10 fathoms occur. The 20-fathom curve is distant about 20 miles, the 100-fathom curve nearly 50 miles.

Geographical position.—Latitude, $37^{\circ} 57'$ ($03''$) N.; longitude, $75^{\circ} 05'$ ($29''$) W.

Depth of water.—Ten and one-half fathoms.

Range of temperature (March 1 to January 1).—Air, 48° (33° to 51°); surface, 41° ($35^{\circ}.5$ to $76^{\circ}.5$.)

Winter-Quarter Shoal light-ship may be regarded as the southernmost of a third series of stations in which the surface temperature seldom exceeds 75° F., and within the period plotted (March to January) may fall (according to the records) to nearly 35° . The surface curves are somewhat less uniformly parallel with the air curves than at the more southern stations, but the differences are not very marked.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	9.5	7.7	8.1	9.4	11.6	7.5	5.5	12.2	10.6	12	7.5	6.1
Southeast.....	2.7	4	5.3	5.7	5.6	9.3	5.1	5.4	5.1	5.3	2.3	4
Southwest	8.6	7.8	6.8	6.9	10.8	9.6	14.1	9.5	10.5	7.8	9.9	9.8
Northwest	9.9	7.9	9.9	6	1.9	1.8	2.8	2.2	2.8	4.8	9.8	9.5

OCEAN TEMPERATURE CHART No. 10

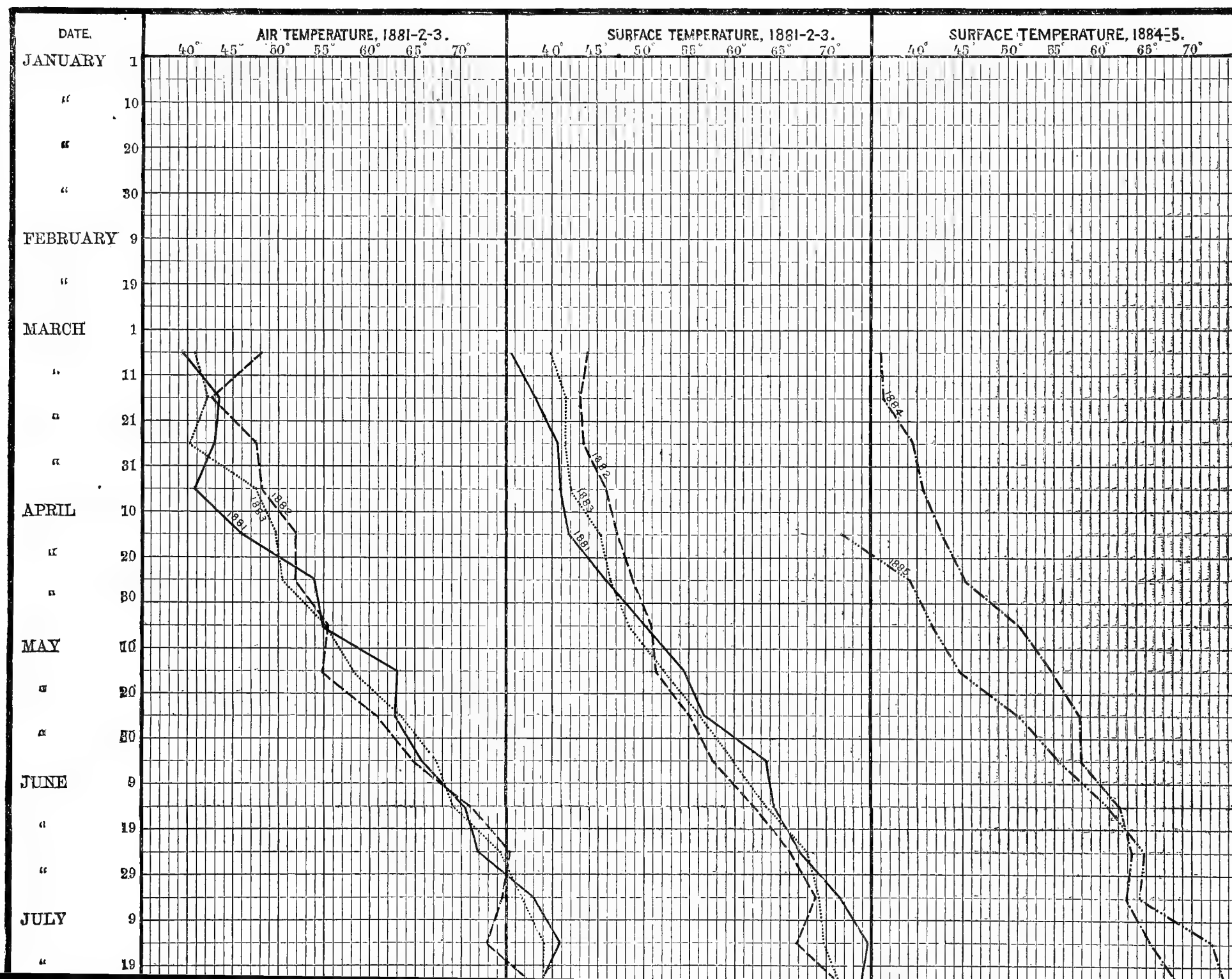
By RICHARD RATHBUN.

Station: Winter Quarter Shoal Light Ship, Virginia.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, — — — 1882, 1883, — — — 1884, — — — 1885.

(Issued in 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 11.

FIVE-FATHOM BANK LIGHT-SHIP, NEW JERSEY.

Observers: JOHN REEVES, DANIEL MANLOVE, WILLIAM W. SMITH.

Location of station.—This light-ship is located about 14 miles from the nearest part of the New Jersey coast, just east of Cape May, north of the entrance to Delaware Bay, and about 56 miles northeasterly from Winter-Quarter Shoal light-ship. It is anchored about $1\frac{1}{2}$ miles outside of the 10-fathom curve, in a depth of 12 fathoms. The 20-fathom curve is distant $13\frac{1}{2}$ miles, the 100-fathom curve 55 miles.

Geographical position.—Latitude, $38^{\circ} 48' (23'')$ N.; longitude, $74^{\circ} 36' (09'')$ W.

Depth of water.—Twelve fathoms.

Range of temperature (March 1 to January 1).—Air, 47° ($36^{\circ}.5$ to $83^{\circ}.5$); surface, 39° (37° to 76°).

The temperatures at this station differ somewhat from those at Winter-Quarter Shoal, and not constantly in the same direction, being sometimes slightly higher, at others slightly lower, during corresponding periods. With a single marked exception, the summer air temperatures average lower here; the surface curves are more nearly like those at Winter Quarter, but do not show so low a minimum in the colder months plotted. An unusually high air temperature was reached between June 19 and 29, 1882, accompanied mainly by southwesterly winds, which are the prevailing winds for that month. This extreme variation is not observable at the neighboring stations, and it apparently had no influence upon the temperature of the water at this place.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	Febru- ary.	March.	April.	May.	June.	July.	August.	Septem- ber.	October.	Novem- ber.	Decem- ber.
Northeast.....	5.2	6.1	6.3	6.8	9	6	5.5	9.3	9.4	9	6.3	4.2
Southeast	1.8	2.9	3.7	5.2	6	7	5.5	5.9	4.6	4.2	2.1	3.2
Southwest	7.8	6.3	6.8	6.6	10	12.9	14.1	10.5	11.7	8.6	9	9.7
Northwest.....	14.4	11.5	13.4	8.9	5	3.1	4.2	3.8	3.8	7.9	12.1	12.

OCEAN TEMPERATURE CHART No. 11

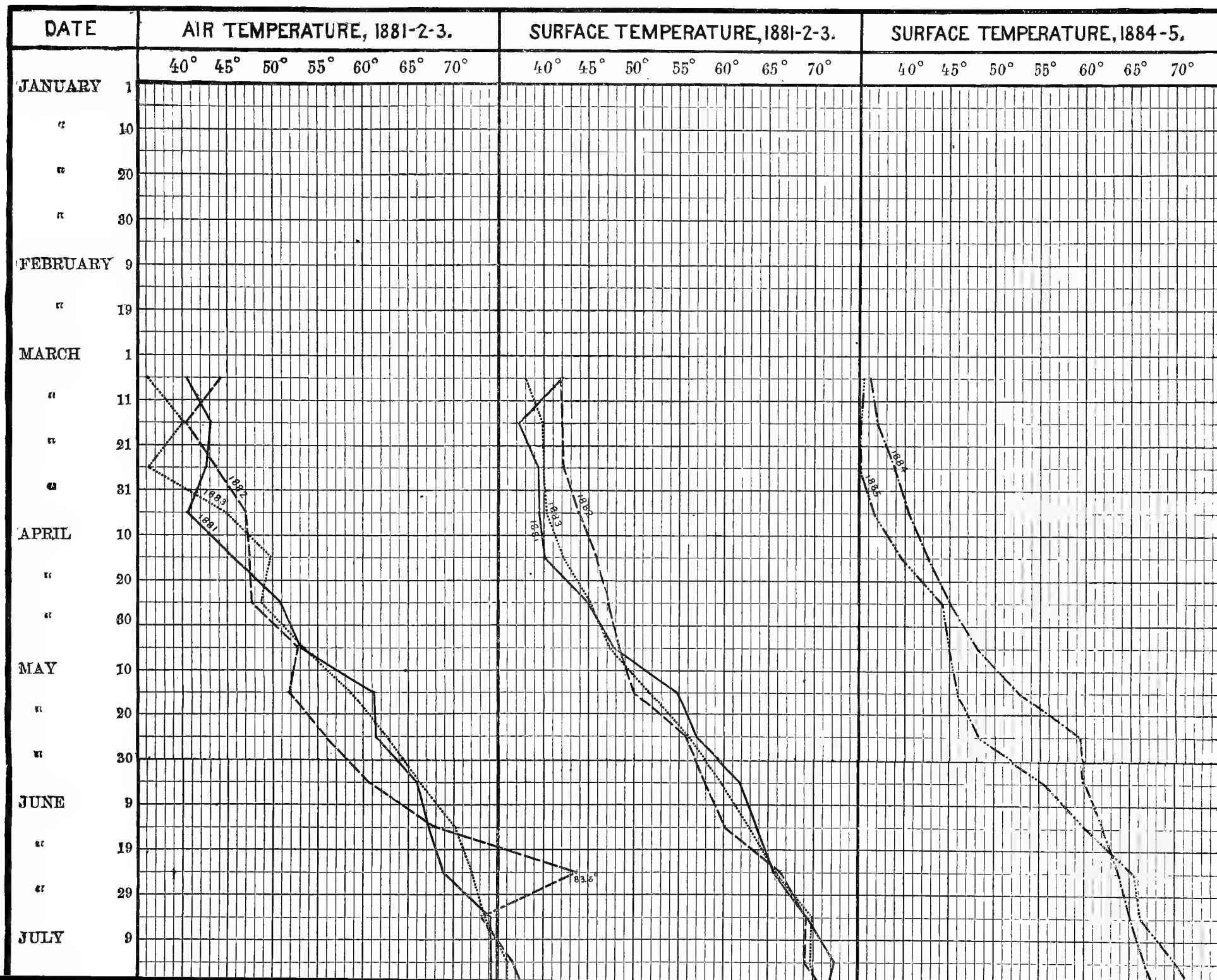
By RICHARD RATHBUN.

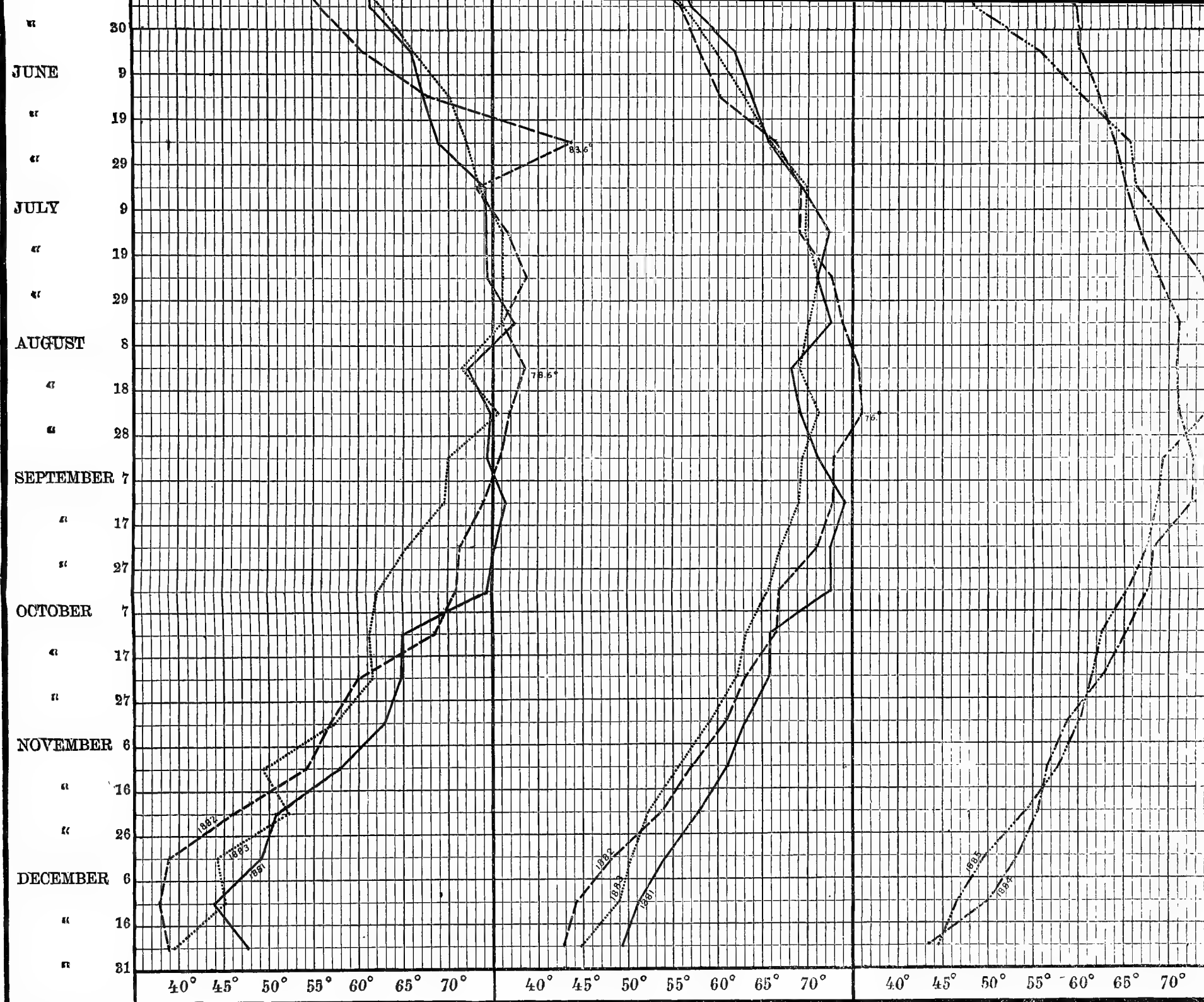
Station: Five Fathom Bank Light Ship, New Jersey.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, ——— 1882, ——— 1883, ——— 1884, ——— 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 12.

ABSECON LIGHT-HOUSE, NEW JERSEY.

Observer: A. G. WOLF.

Location of station.—Absecon light-house is located on the beach in front of Atlantic City, N. J., and just south of the entrance to Absecon Inlet. It is $34\frac{3}{8}$ miles N. by E. $\frac{3}{4}$ E. of Five Fathom Bank light-ship. The shore in front of the light-house is faced with shoals. The 10-fathom curve is distant $6\frac{1}{2}$ miles, the 20-fathom curve 34 miles, the 100-fathom curve 70 miles.

Geographical position.—Latitude, $39^{\circ} 21' 59''$ N. ; longitude, $74^{\circ} 24' 52''$ W.

Depth of water.—Nine to 15 feet.

Range of temperature (March 1 to January 1).—Air, $46^{\circ}.5$ (33° to $79^{\circ}.5$); surface, 45° ($34^{\circ}.5$ to $79^{\circ}.5$).

Although located on the shore of an inlet, protected by shoals in front, this station affords more satisfactory results than either Body's Island or Cape Lookout. The ranges of temperature given above are essentially the same for both the air and surface, but if we except the surface curve for 1885, and compare only the air and surface curves for corresponding years, 1881–1883, we find that the maximum for the air exceeds that for the surface by nearly five degrees. The conditions are, therefore, very much the same at Absecon as at Five Fathom Bank, and the surface curves are nearly as regular.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	5.2	7.2	7.8	9.7	10.3	7.9	8.5	9.8	10.3	8.6	4.4	3.8
Southeast	2.8	2.8	4.3	6.7	11.2	12.1	10	9.4	8.2	7.1	4.2	3.9
Southwest	6.9	5.3	6.2	4.9	4.8	6.3	7.5	6.9	6.9	6.2	8.9	9.4
Northwest	16	12.9	12.7	8.5	4.5	3.5	4.6	4.6	4.5	8.7	12.1	13.8

OCEAN TEMPERATURE CHART No. 12

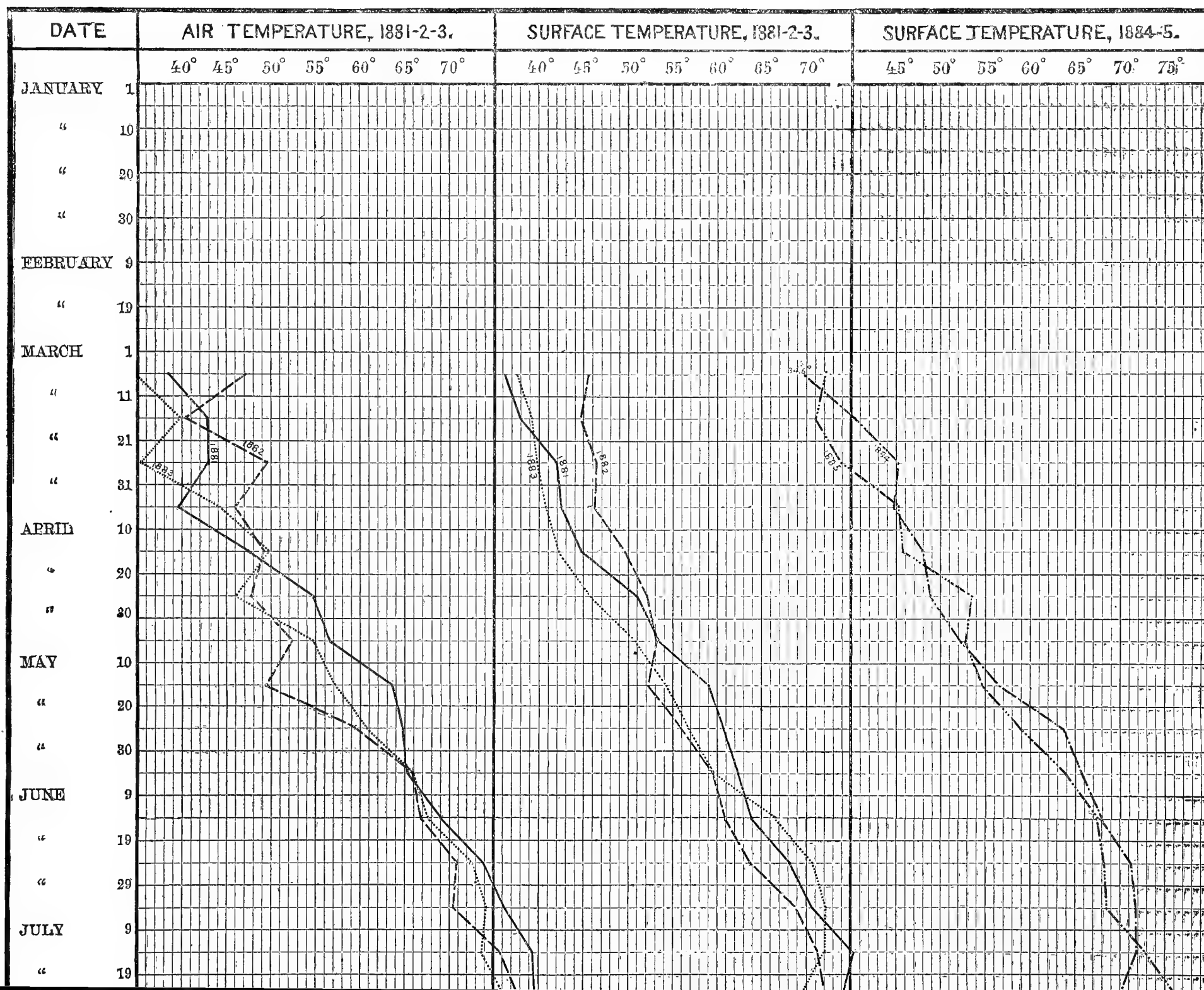
By RICHARD RATHBUN.

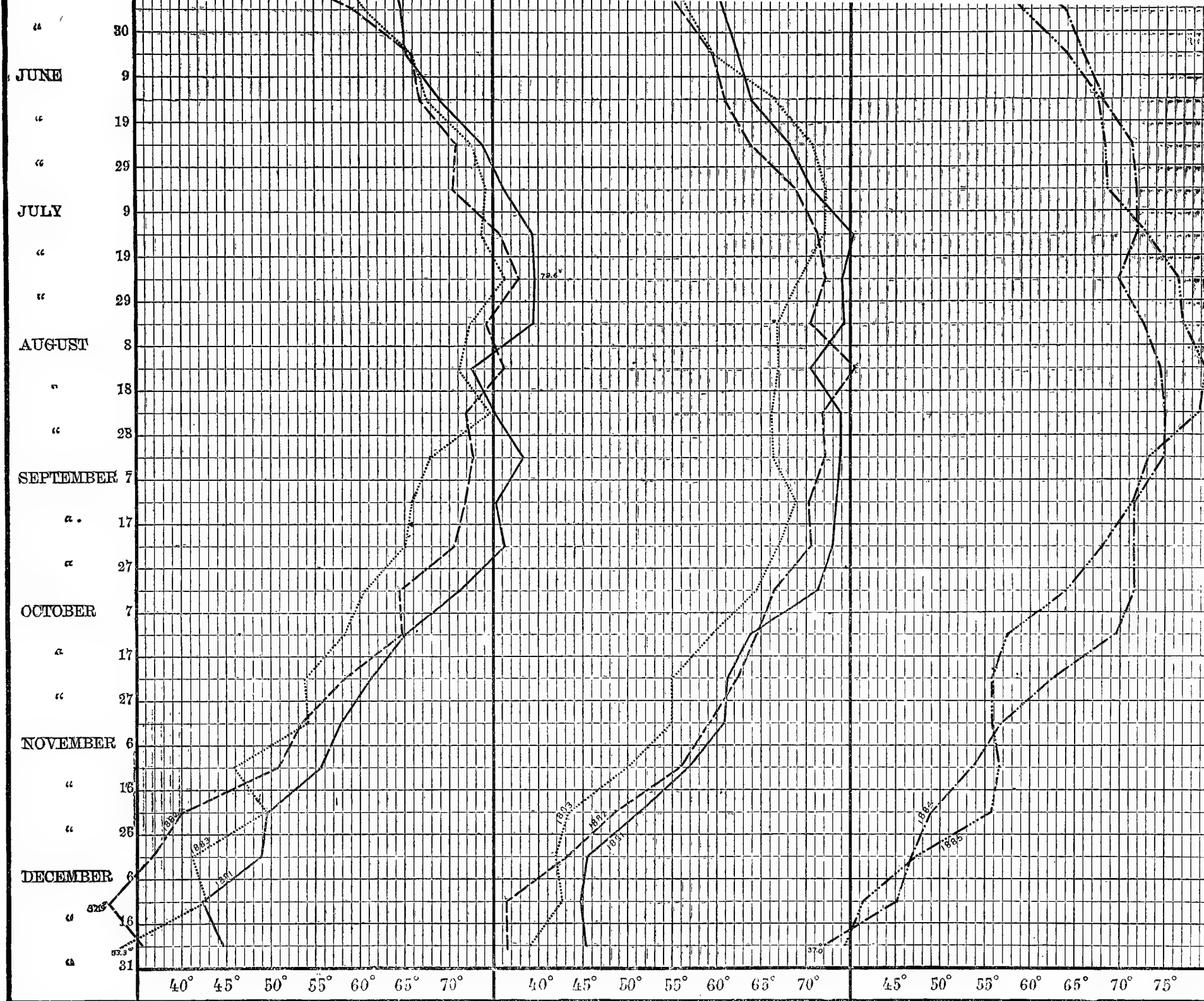
Station: Absecon Inlet Light House, New Jersey.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, ——— 1882, 1883, ——— 1884, ——— 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 13.

SANDY HOOK LIGHT-SHIP, NEW YORK.

Observers : JAMES COSGROVE, R. H. PRITCHARD.

Location of station.—This light-ship is anchored in 14 fathoms of water, off the entrance to New York Bay, 6 miles east of Sandy Hook, N. J., the nearest land, and $8\frac{1}{2}$ miles south of Rockaway Beach, Long Island. It is distant about 70 miles northeasterly from Absecon light. The 15-fathom curve forms a bight extending in towards New York Bay entrance, and reaching nearly to the light-ship, inside of which the depths decrease somewhat rapidly. The 20-fathom curve is distant 16 miles; the 100-fathom curve, 95 miles.

Geographical position.—Latitude, $40^{\circ} 26'$ ($12''$) N.; longitude, $73^{\circ} 51'$ ($42''$) W.

Depth of water.—Fourteen fathoms.

Range of temperature (March 1 to January 1).—Air, 50° ($31^{\circ}.5$ to $81^{\circ}.5$); surface, $41^{\circ}.5$ (33° to $74^{\circ}.5$).

The range of air temperature is greater than at any of the three preceding stations, but the maximum is two degrees lower than at Five-Fathom Bank, about the same as at Winter Quarter Shoal, and two degrees higher than at Absecon. The maximum surface temperature is slightly lower than at the preceding stations.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	7	6.7	6	5.3	6.4	3.6	3.5	6.6	7.6	8.6	6	6.5
Southeast	3	3.1	4.6	5.5	10.4	11	9.5	8.3	8.8	6.4	3.9	3.7
Southwest	4.9	3.7	3.8	5.7	4.9	7.1	8.3	7.3	6.8	5.7	6.1	5.8
Northwest	15.6	12.6	15	11.5	7	6.7	8.1	7	5.7	9.5	13.6	14.6

OCEAN TEMPERATURE CHART No. 13

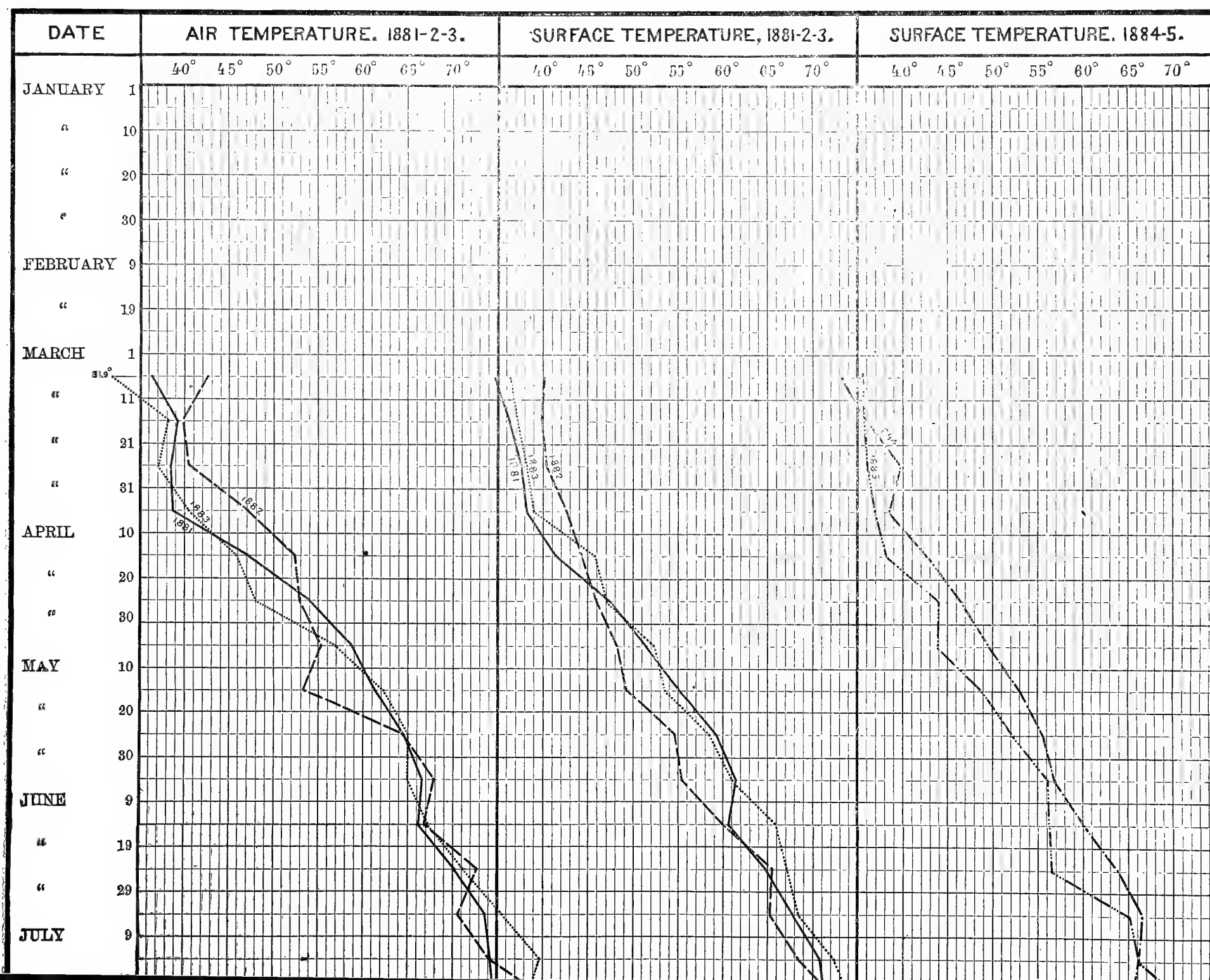
By RICHARD RATHBUN.

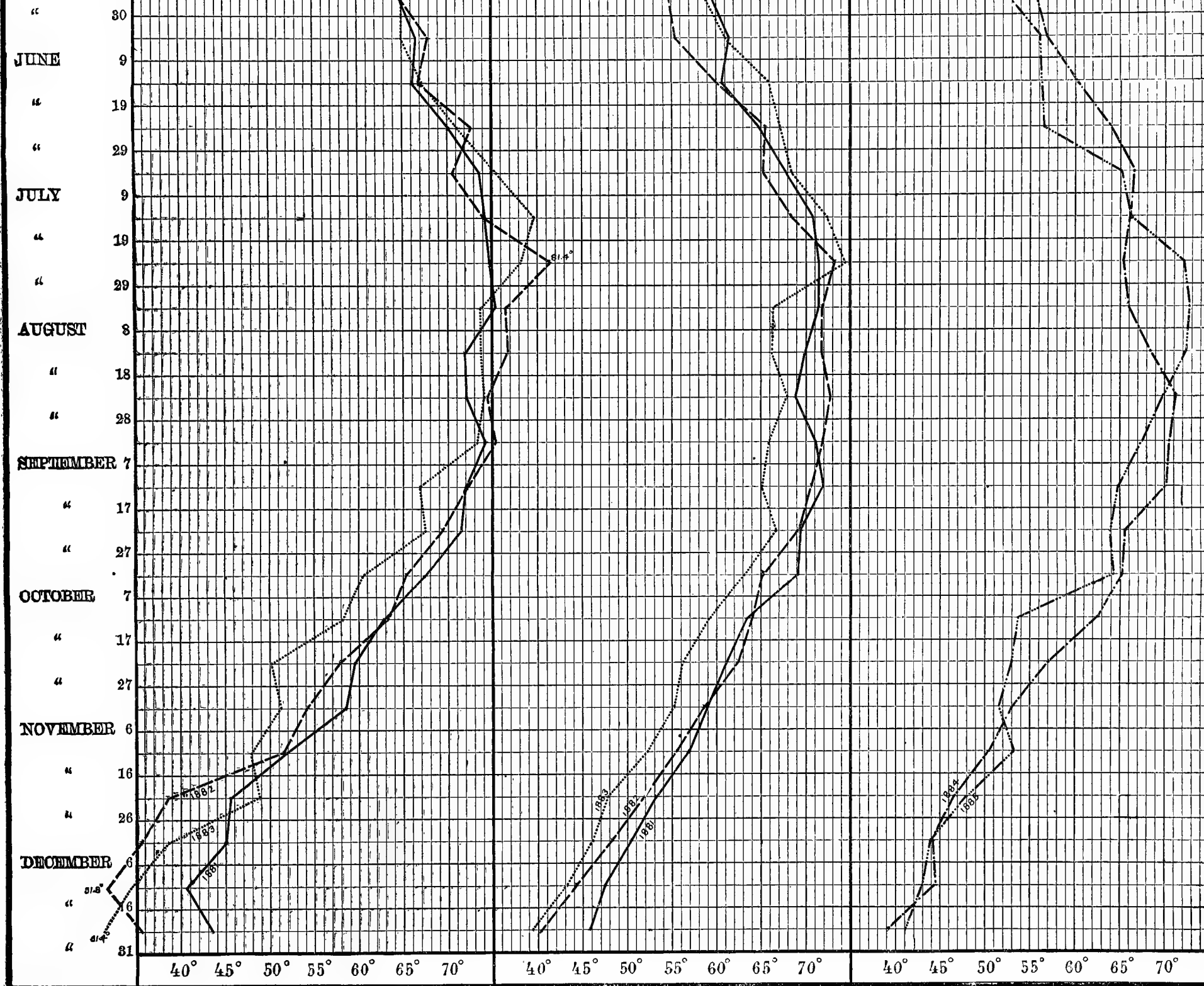
Station: Sandy Hook Light Ship, New York.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, - - - 1882, 1883, ——— 1884, ——— 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 14.

FIRE ISLAND LIGHT-HOUSE, NEW YORK.

Observers: C. A. BLYDENBURGH, SETH R. HUBBARD.

Location of station.—This light-house is situated on the east side of Fire Island Inlet, south side of Long Island, 31 miles E. by N. from Sandy Hook light-ship; and the observations were taken in the narrow entrance to Great South Bay, between Fire Island and Oak Island. The 10-fathom curve is distant $1\frac{1}{2}$ miles from the outer beach; the 20-fathom curve, 18 miles; the 100-fathom curve, 85 miles.

Geographical position.—Latitude, $40^{\circ} 37' 57''$ N.; longitude, $73^{\circ} 13' 09''$ W.

Depth of water.—Three feet.

Range of temperature (March 1 to January 1).—Air, $48^{\circ}.5$ (35° to $83^{\circ}.5$); surface, 40° (35° to 75°).

The observations at this station were probably taken in rapidly running water, as the surface curves are comparatively regular, and the maximum surface temperature is 8° lower than the maximum for the air. In the range of both air and surface temperatures this station agrees most closely with Five-Fathom Bank, the differences being very slight.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	5.8	4.6	5.3	4.5	5	3.3	3.2	5.3	5.9	7	5.4	7.4
Southeast	1.7	4.2	3.8	4.6	8	4.7	4.7	5.5	4.7	4.9	1.9	1.8
Southwest	7.3	6.4	6.6	8.9	8.7	12.7	13.2	12.5	11.5	7.7	8.3	8.8
Northwest	11.6	9.6	10.9	7.6	3.9	3.6	4.9	2.1	3.5	6.9	9.8	8.4

OCEAN TEMPERATURE CHART No. 14

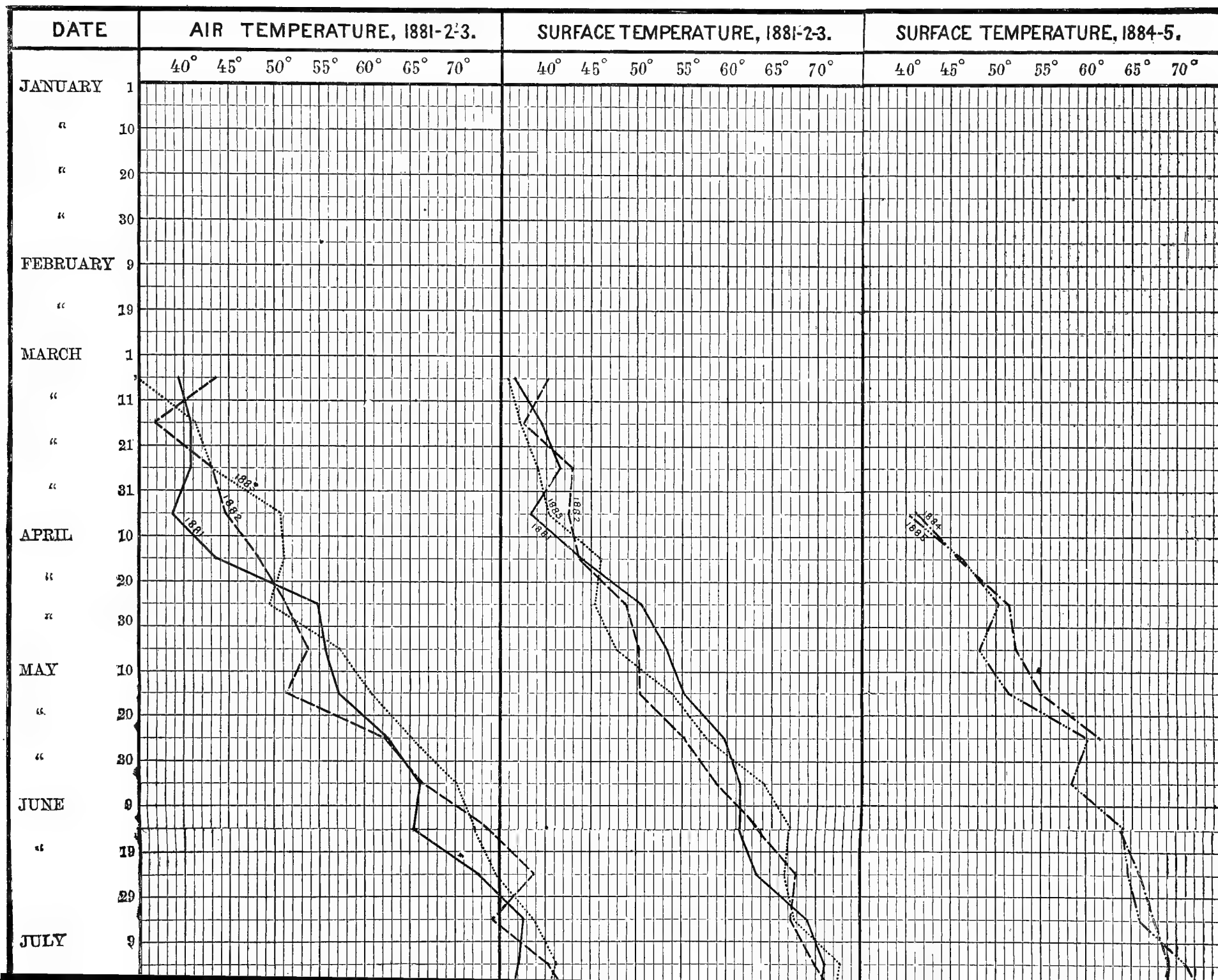
By RICHARD RATHBUN.

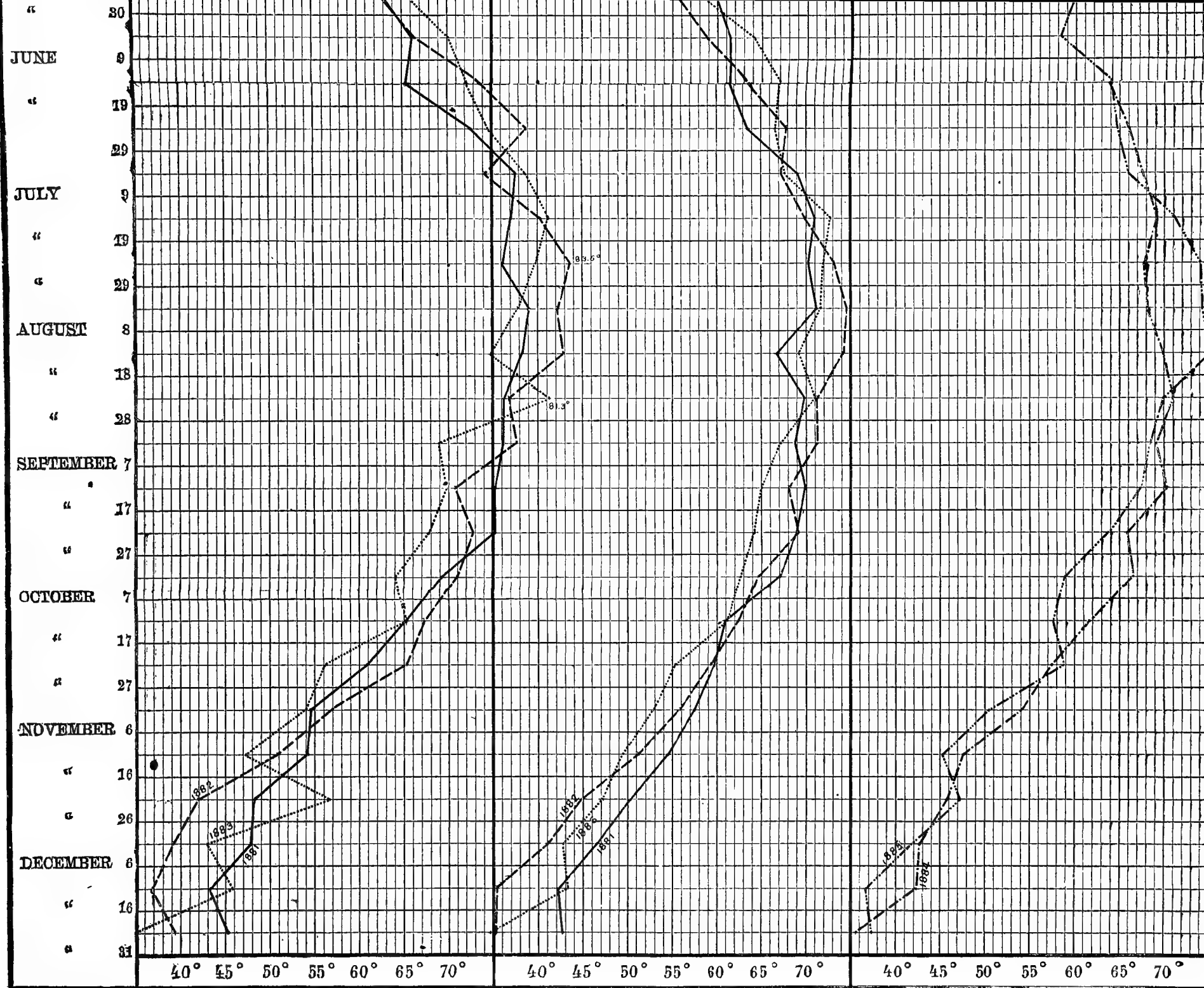
Station: Fire Island Light House, New York.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, — — — 1882, 1883, — — — 1884, — — — 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 15.

BLOCK ISLAND SOUTHEAST LIGHT-HOUSE, RHODE ISLAND.

Observer : H. W. CLARK.

Location of station.—This light-house is located on the high bluff at the southeastern extremity of Block Island, and is distant 82 miles northeasterly from Fire Island Light-house, and $78\frac{1}{2}$ miles W. by N. $\frac{3}{4}$ N. from Nantucket New South Shoal light-ship. The water is very shallow off the southern end of the island, the depths increasing gradually seaward. The 20-fathom curve is distant about 5 miles; the 100-fathom curve, about 70 miles.

Geographical position.—Latitude, $41^{\circ} 09' 10''$ N., longitude, $71^{\circ} 33' 09''$ W.

Depth of water.—The observations were taken at the edge of the beach, below the light-house, facing the open sea to the south.

Range of temperature (March 1 to January 1).—Air, 57° (22° to 79°); surface, 41° ($29^{\circ}.5$ to $70^{\circ}.5$).

Although the observations were taken from the beach, the surface curves show little direct influence of the air temperature upon the water, and are comparatively regular. The maximum air temperature is about the same as at Absecon, N. J., but the maximum for the surface is four degrees lower than at any of the stations to the west and south.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	6.7	4.8	8.1	8.7	8.9	5.2	4.1	6	9.8	10.9	5.4	7
Southeast	4.3	4.2	2.2	3.5	5.6	4	3.8	4	5	4.1	2.7	2.2
Southwest	7.5	6.2	8.2	11	10.7	16.9	16.7	17.6	11.3	12.1	9.9	9.7
Northwest	12.5	8.8	11.7	6.8	4.6	3.7	4.2	3.2	3.9	3.9	9.8	9.9

OCEAN TEMPERATURE CHART No. 15

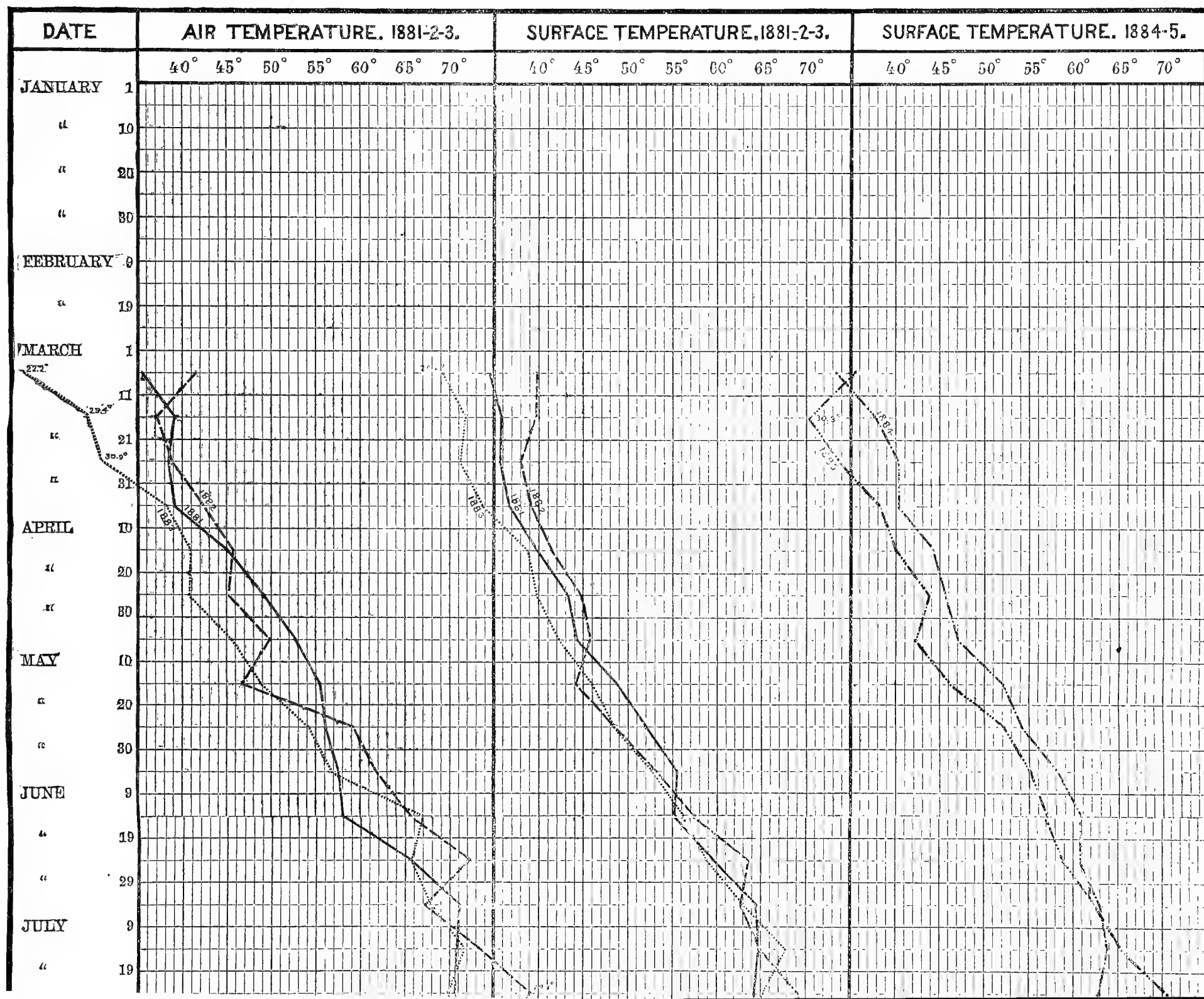
By RICHARD RATHBUN

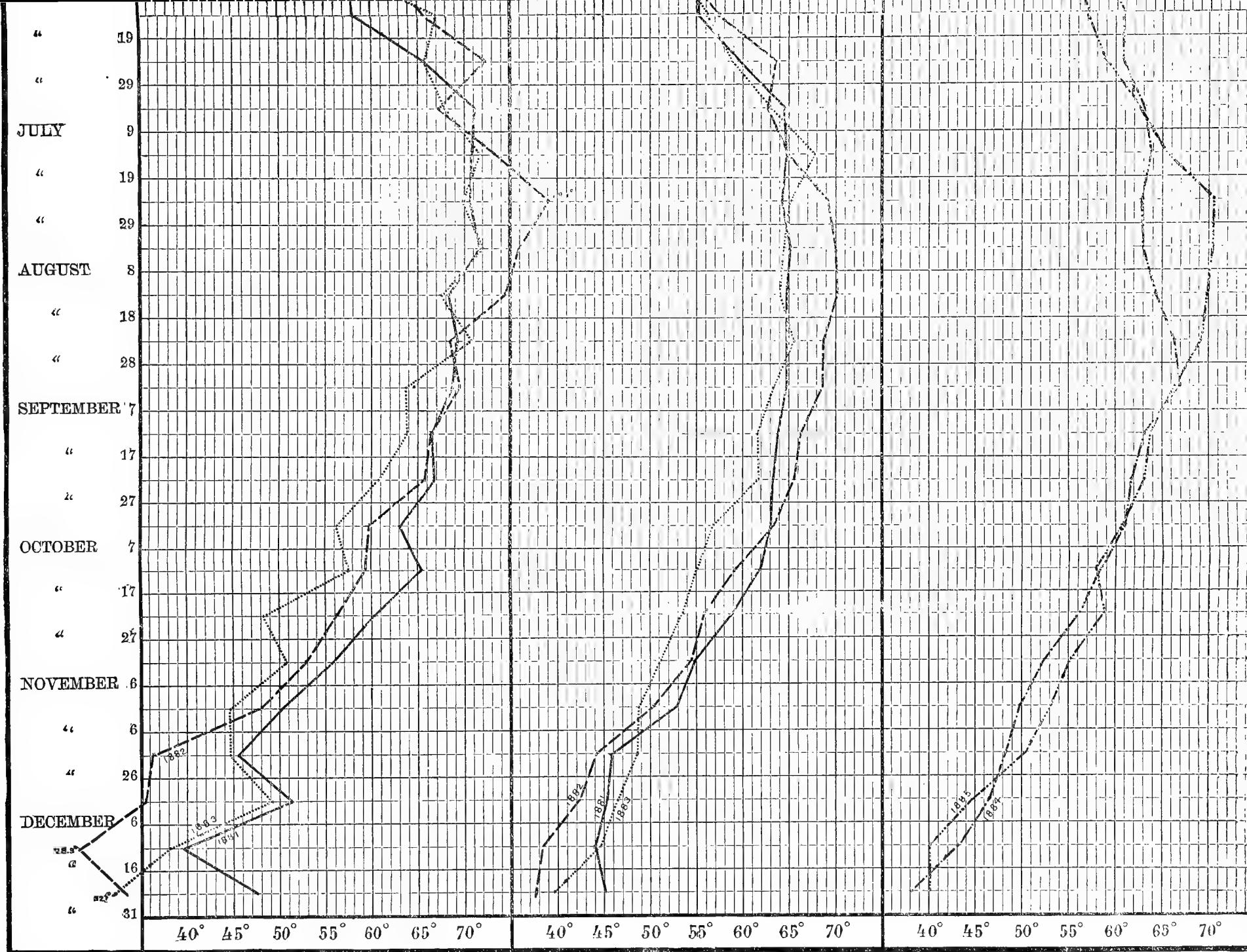
Station: Block Island S. E. Light House, Rhode Island.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, - - - 1882, 1883, ——— 1884, ——— 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 16.

BRENTON'S REEF LIGHT-SHIP, RHODE ISLAND.

Observer: CHARLES D. MARSH.

Location of station.—This light-ship is located in the middle of the entrance to Narragansett Bay, about $1\frac{1}{2}$ miles SW. of the southern point of the Island of Rhode Island, and a little over a mile off Brenton's Reef, the depths between ranging from $4\frac{1}{2}$ to $14\frac{1}{2}$ fathoms. It is $17\frac{3}{4}$ miles NE. $\frac{1}{2}$ N. of Block Island southeast light, and faces the open sea to the south, the depths increasing gradually seaward. The 20-fathom curve is distant about $8\frac{1}{2}$ miles; the 100-fathom curve, about 85 miles.

Geographical position.—Latitude, $41^{\circ} 25'$ ($52''$) N.; longitude, $71^{\circ} 22'$ ($36''$) W.

Depth of water.—Fourteen and one-half fathoms.

Range of temperature (March 1 to January 1).—Air, $45^{\circ}.5$ (29° to $74^{\circ}.5$); surface, 35° (34° to 69°).

The minimum temperatures are higher, the maximum lower at this station than at Block Island. The maximum surface temperatures, however, show a difference of only $1\frac{1}{2}^{\circ}$ for the two stations. It is probable that the surface observations for Brenton's Reef are the more reliable, having been taken where the water is $14\frac{1}{2}$ fathoms deep.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	4	5	5.5	6.2	7.1	2.7	2.8	4.6	6	8.1	4.7	4.9
Southeast	3	3.3	4.4	4.6	7.6	6.2	6	4.8	6.3	4.8	2	2.9
Southwest	8.7	6.3	6.4	9.6	10.8	15	15.5	15.9	10.9	9.7	11	9.4
Northwest	14	12.1	13.2	8.5	4	3.8	4	4.1	4.7	7.1	11.6	13.2

OCEAN TEMPERATURE CHART No. 16

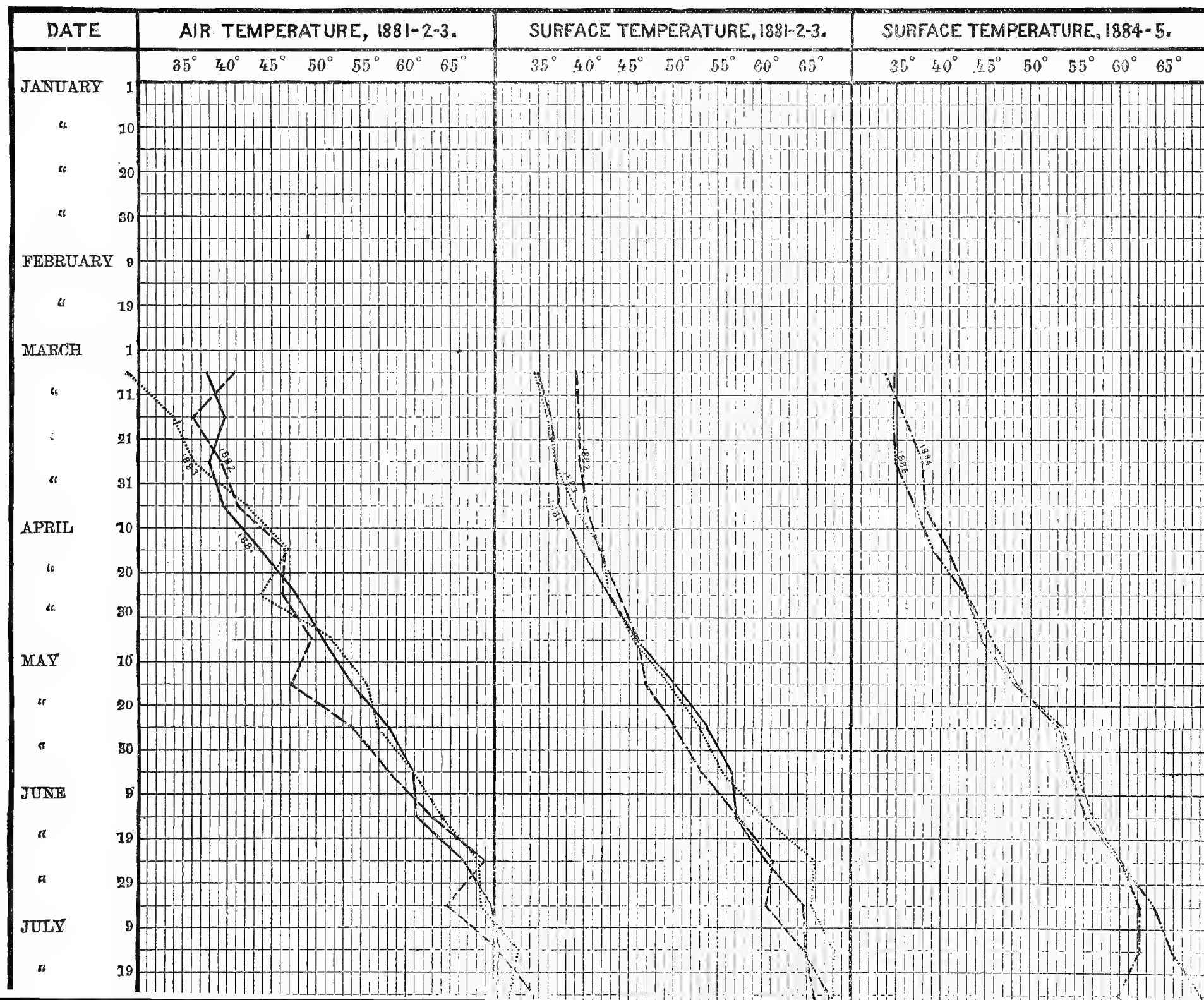
By RICHARD RATHBUN.

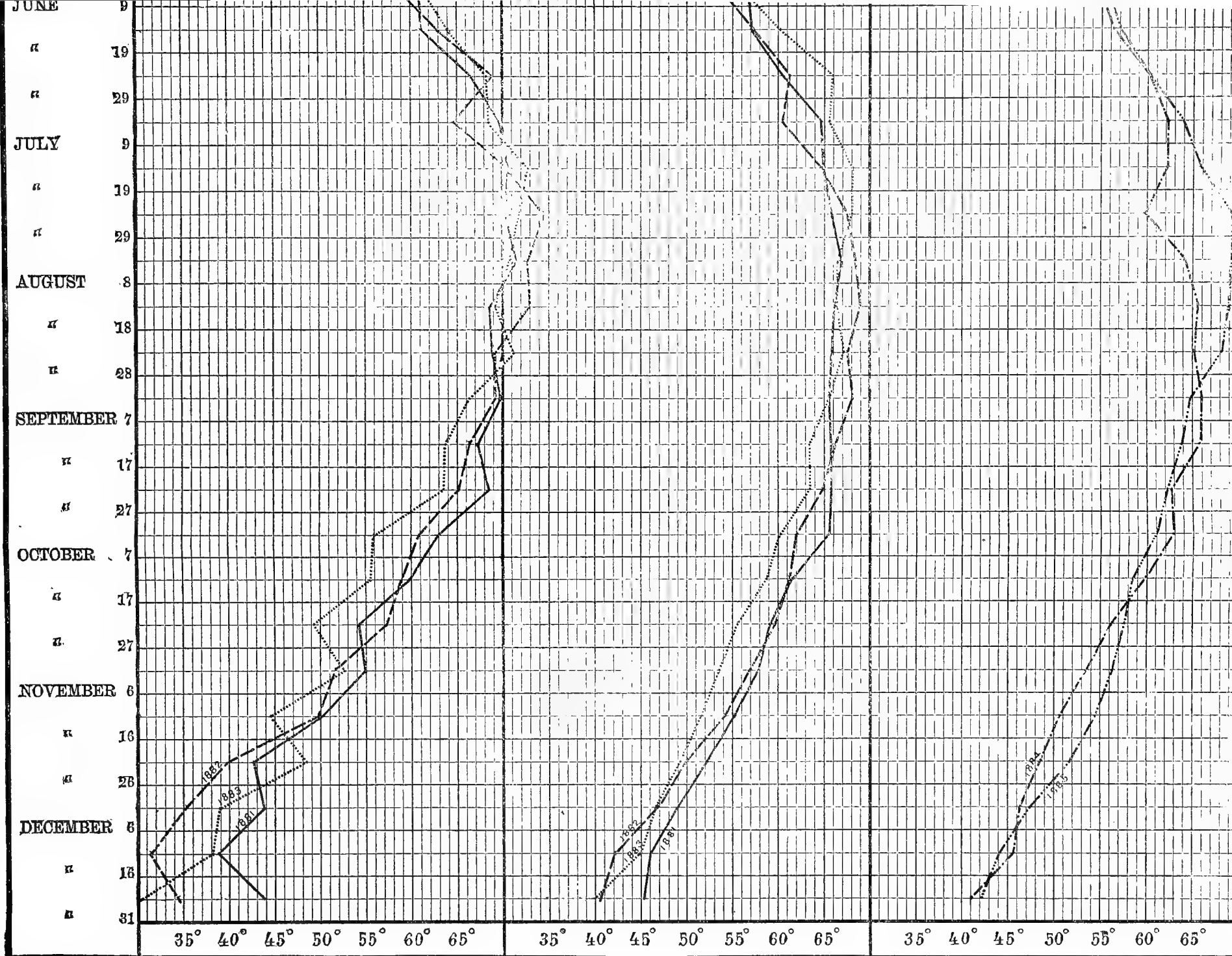
Station: Brenton's Reef Light Ship, Rhode Island.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, — — — 1882, 1883, - - - 1884, — — — 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 17.

VINEYARD SOUND LIGHT-SHIP, MASSACHUSETTS.

Observers: WILLIAM H. DOANE, A. H. BRAY.

Location of station.—The Vineyard Sound, or “Sow and Pigs” light-ship, as it was formerly called, is anchored 1 mile to the southwestward of Sow and Pigs Reef, and 2½ miles SW. by W. of the light on Cuttyhunk Island, the southernmost of the Elizabeth Group. It is situated 17½ miles E. by S. ½ S. of Brenton’s Reef light-ship, and on the western side of the southern entrance to Vineyard Sound. Within a radius of a mile the depths range from 4½ to 16½ fathoms. The 20-fathom curve is distant about 6 miles; the 100-fathom curve, about 80 miles.

Geographical position.—Latitude, 41° 23′ (02″) N.; longitude, 70° 59′ (01″) W.

Depth of water.—Fifteen fathoms.

Range of temperature (March 1 to January 1).—Air, 43° (28°.5 to 71°.5); surface, 37° (31° to 68°).

The temperatures for the colder months were evidently more carefully read here than at most of the northern stations, and the curves have been plotted on the chart for the entire year. In reckoning the ranges of temperature, however, January and February have been omitted to facilitate comparisons with the neighboring stations. Compared with Brenton’s Reef, the maximum air record is 3° lower, the maximum surface only 1° lower, indicating closely corresponding conditions.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years’ observations.

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	5.8	6.5	6.3	6.9	8.6	4.3	4.4	6.3	9.3	10.2	6	5.5
Southeast	2.4	4.5	4.3	3.6	5.8	5.5	5.3	5.4	4.5	4.1	1.9	2.2
Southwest	8.6	5.3	7.8	10.7	12.3	16.3	16	14.8	11.3	9.4	11.1	9.3
Northwest	13.8	10.2	11.7	6.8	3	2.9	3.6	2.1	4.1	6.5	10.2	13.8

OCEAN TEMPERATURE CHART No. 17

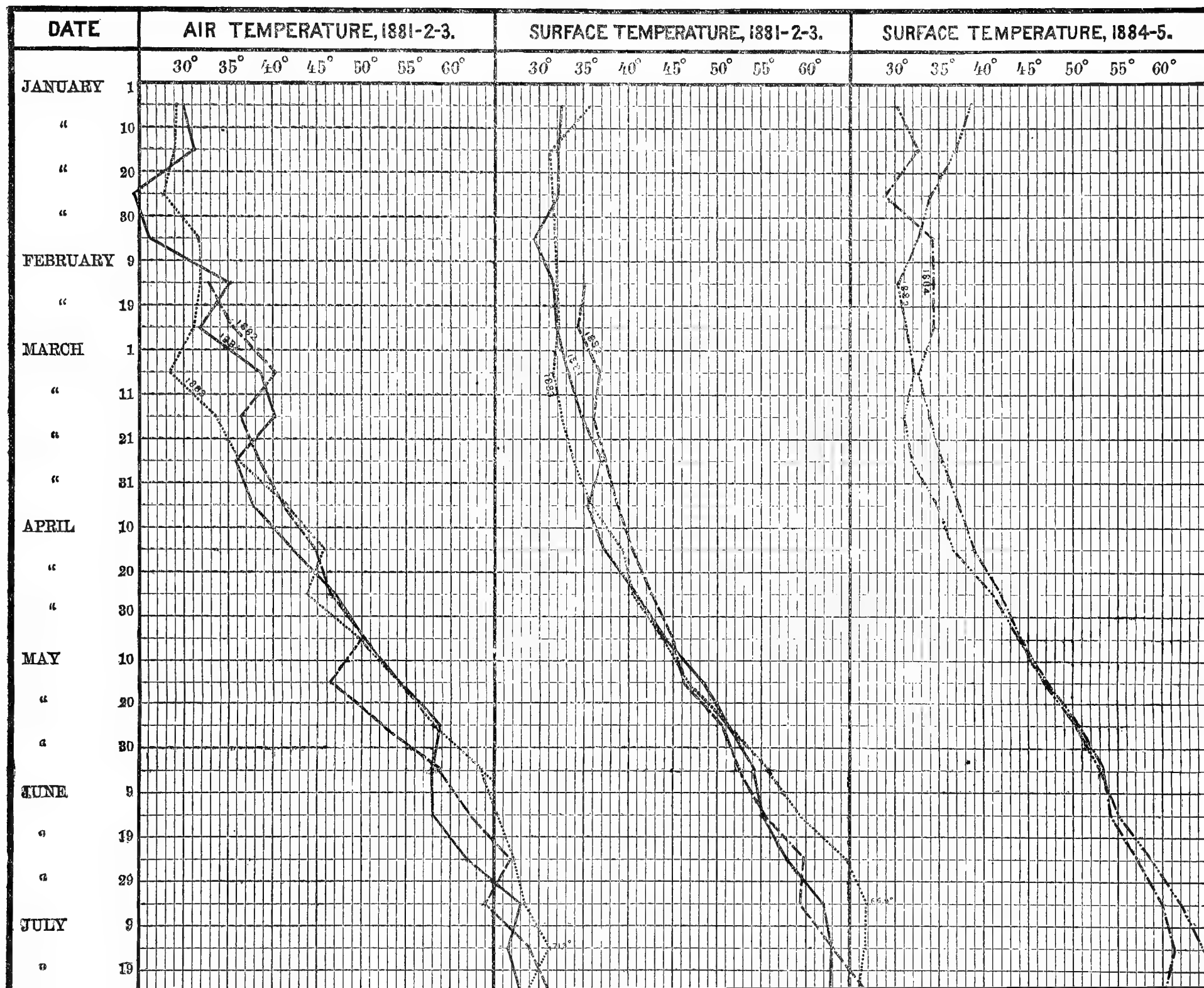
By RICHARD RATHBUN.

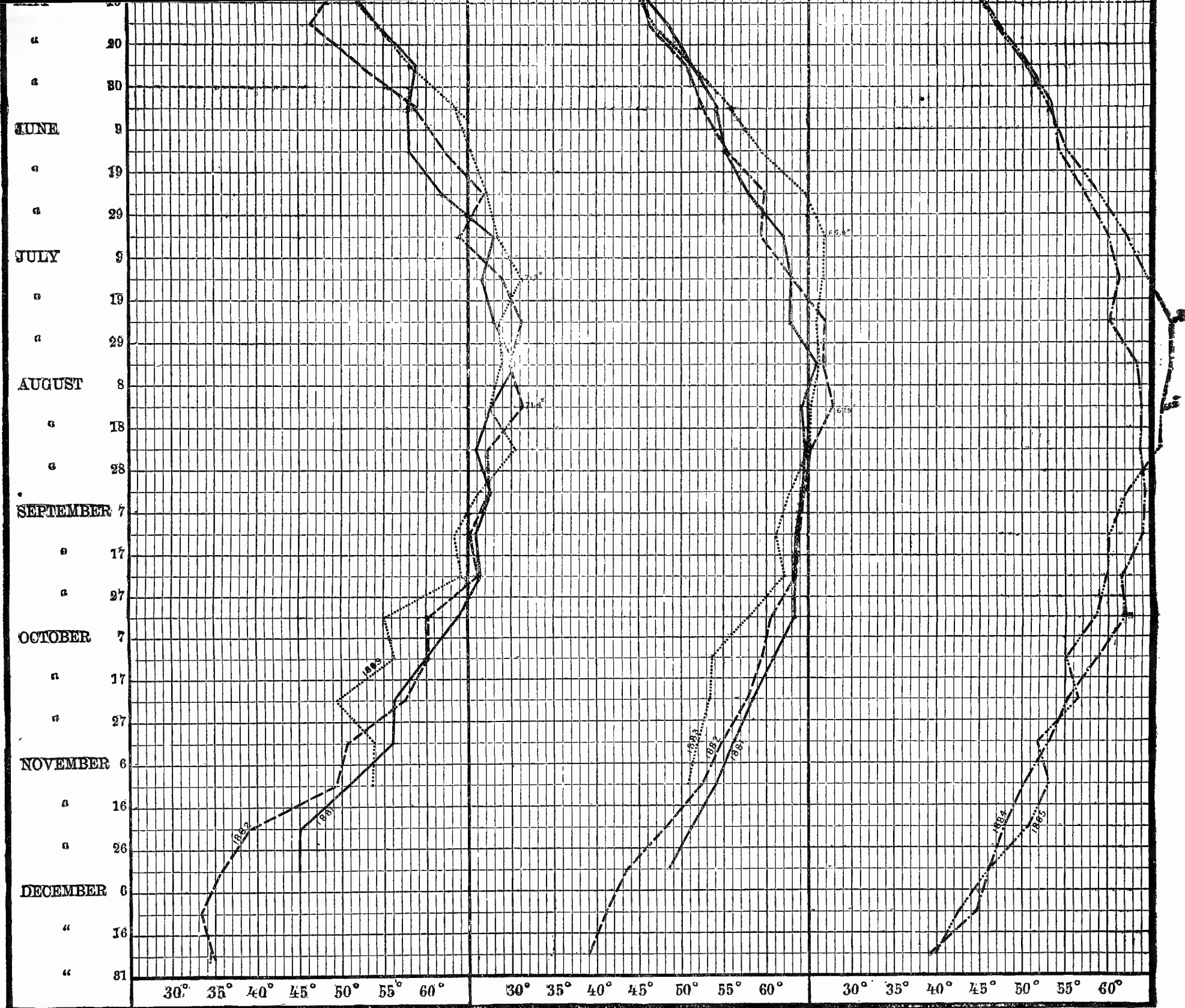
Station: Vineyard Sound Light Ship, Massachusetts.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, — — — 1882, 1883, — — — 1884, — — — 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882, and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 18.

NANTUCKET NEW SOUTH SHOAL LIGHT-SHIP.

Observers: T. S. JAMES, A. J. SANDBURG, ISAAC HAMBLEX.

Location of station.—Nantucket (or Davis') New South Shoal light-ship is placed at the southern end of Nantucket Shoals, about 3 miles SSE. of the shoalest part of Davis' New South Shoal, and 21 miles SE. of Nantucket Island, the nearest land. It is distant from Vineyard Sound light-ship about 58 miles in a southeasterly direction. In the immediate vicinity the depths range from 11 to 18 fathoms. The water deepens gradually seaward, attaining a depth of 30 fathoms at distances of 22 to 25 miles; the 100-fathom curve is distant about 60 miles.

Geographical position.—Latitude, $40^{\circ} 54'$ ($51''$) N.; longitude, $69^{\circ} 49'$ ($26''$) W.

Depth of water.—Sixteen to 18 fathoms.

Range of temperature (12 months).—Air, 43° (26° to 69°); surface, $28^{\circ}.5$ ($33^{\circ}.5$ to 62°).

The position of this light-ship, over 20 miles from the nearest land, and in the course of those schools of surface fish that pass around or through the Nantucket Shoals in their migrations, especially fits it as a permanent station for temperature and other observations bearing upon the coast fisheries. The temperature of the surface water is more equable here than at any of the preceding stations north of the Florida Reefs, but the maximum surface temperature at Nantucket New South Shoal is 8° lower than the minimum at Fowey Rocks. The comparatively slight range of temperature throughout the year has made it possible to utilize the winter temperatures, all of which have been plotted on the chart.

The range of air temperature from March 1 to January 1 is 40° (29° to 69°), nearly the same as at Vineyard Sound light-ship, the maximum being $2\frac{1}{2}^{\circ}$ lower at New South Shoal than at Vineyard Sound. The lowest air records for the winter months also differ only 2° at these two stations. The maximum surface temperature at New South Shoal is, however, 6° lower than at Vineyard Sound, and the minimum between March and January, about 3° higher. The range of surface temperature is, therefore, considerably less at New South Shoal.

Table showing the direction of the wind, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	4.8	4.1	5	7.3	9.4	5.2	4.1	8.1	10.1	9.3	6.1	4.7
Southeast	4.4	4.2	4.5	3.6	5.1	3.9	5.4	4.6	5.3	5.2	2.9	4.6
Southwest	7.1	5.7	5.8	8.2	9.9	14.8	13	10.5	11.3	9.4	7.2	7.2
Northwest	13.7	12.6	13.8	8.8	4	2.2	2.1	3.9	3.5	7.6	11.9	13.8

OCEAN TEMPERATURE CHART No. 18

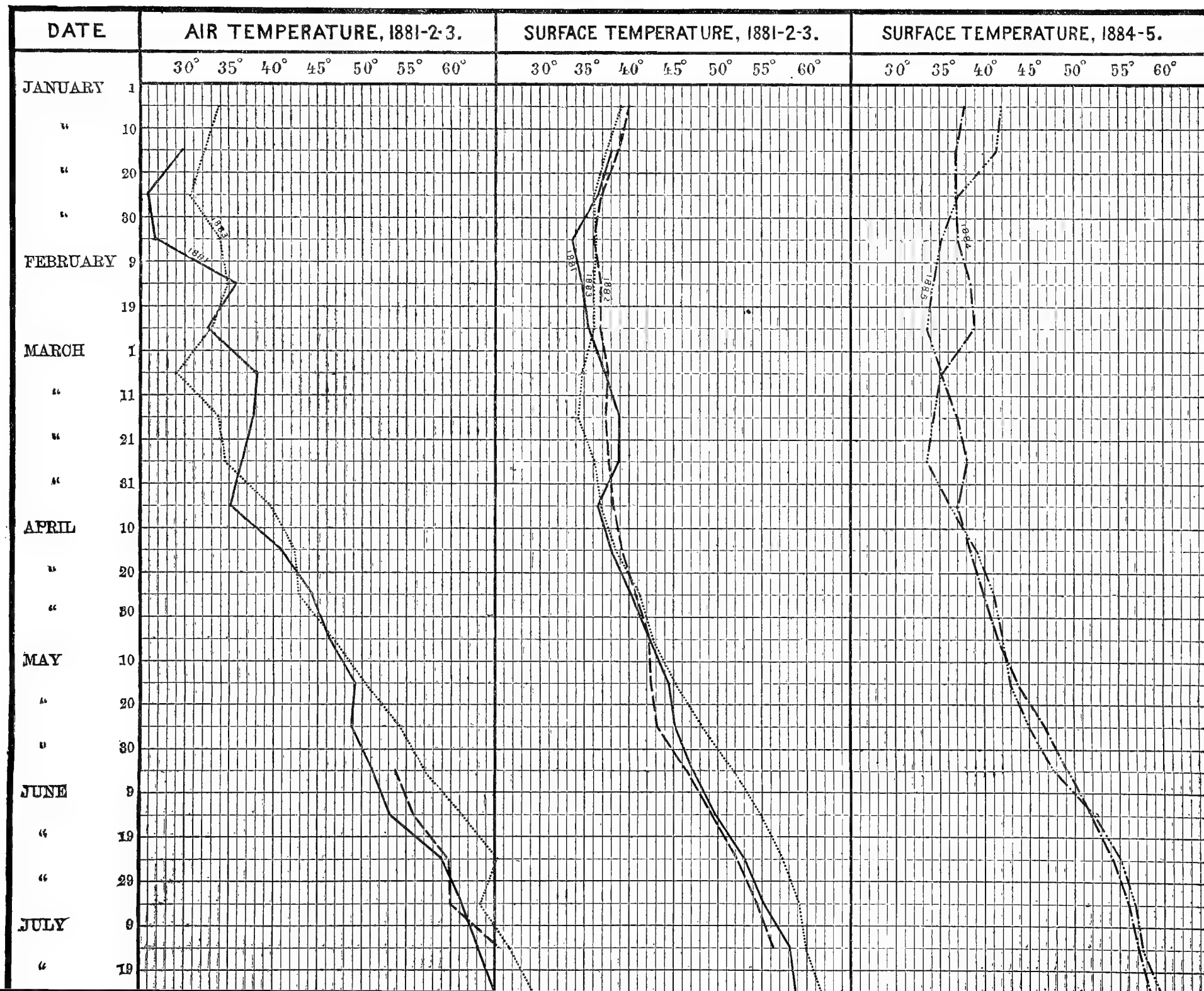
By RICHARD RATHBUN.

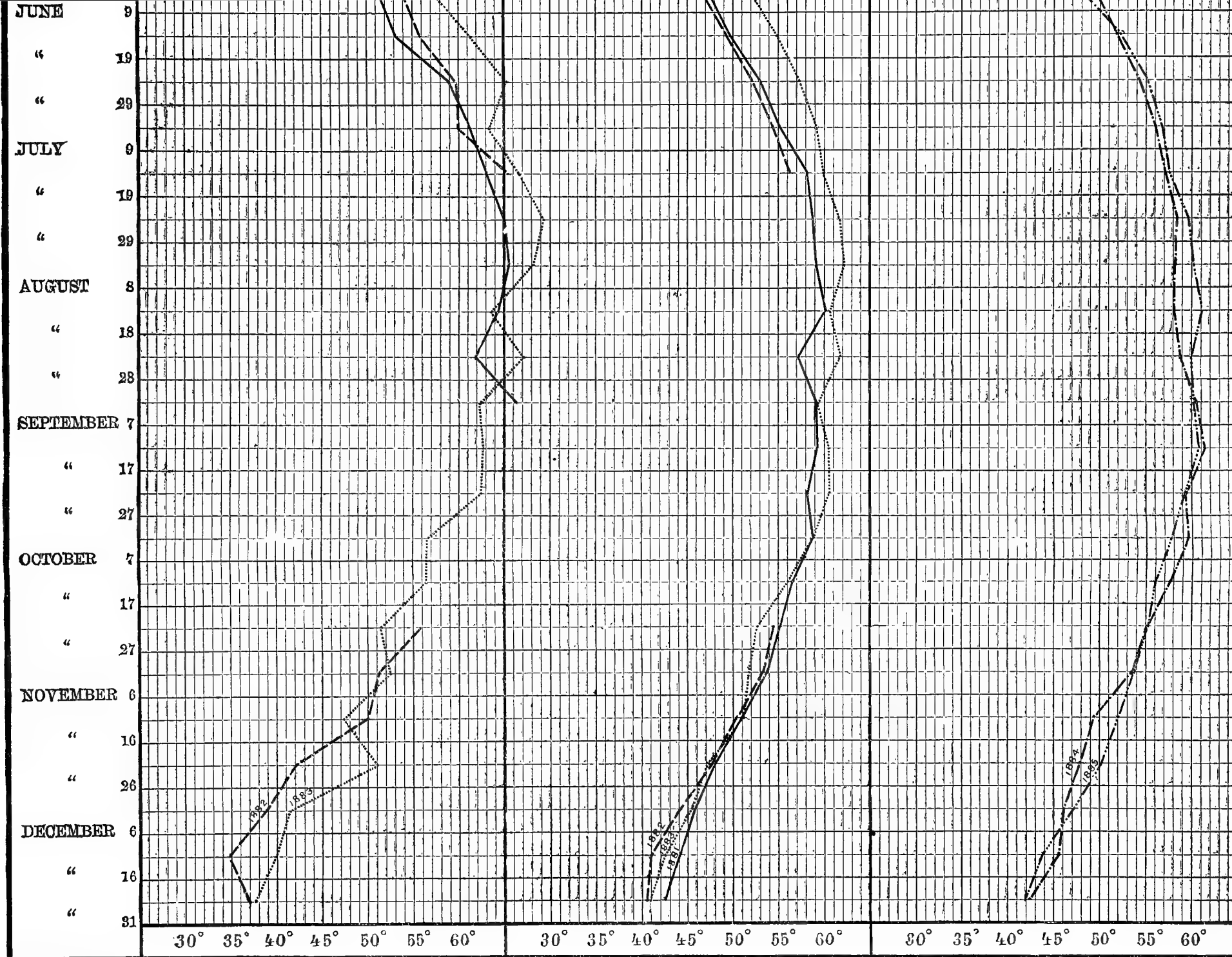
Station: Nantucket New South Shoal Light Ship.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: — 1881, — — 1882, 1883, — — — 1884, — — — 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 19.

POLLOCK RIP LIGHT-SHIP, MASSACHUSETTS.

Observers: WILLIAM HAFFARDS, JAMES F. KELLY, JOSEPH ALLEN, JR.

Location of station.—This light-ship is located in the northeastern entrance to Nantucket or Vineyard Sound, and $3\frac{1}{2}$ miles SE. by E. $\frac{1}{2}$ E. from Monomoy Point light-house, at the southeastern extremity of Cape Cod. It is $1\frac{1}{2}$ miles distant from Pollock Rip Shoal proper, which lies between it and Monomoy Island, and is surrounded on nearly all sides, at different distances, by small shoals or groups of shoals. There is, however, no land to the northeast, east, or southeast of it. It is anchored in a depth of 5 fathoms, and the depths about it range from 4 to 7 fathoms. The bottom in this region consists of sand and gravel. Nantucket New South Shoal light-ship is about 36 miles nearly south.

Geographical position.—Latitude, $41^{\circ} 32'$ ($27''$) N.; longitude, $69^{\circ} 55'$ ($15''$) W.

Depth of water.—Five to 7 fathoms.

Range of temperature (March 1 to January 1).—Air, 39° (27° to 66°); surface, $30^{\circ}.5$ (32° to $62^{\circ}.5$).

The curves of surface temperature are more irregular and less uniform than at the three or four preceding stations, and in many cases the variations do not appear to be due to the influence of the air. They may be caused in part by the currents flowing through the numerous passageways between the surrounding shoals. The ranges of temperature correspond closely with the same at Nantucket New South Shoal, the maximum air temperature being 3° lower at this station, but the maximum and minimum for the surface are almost precisely alike at both. The maximum surface temperature at Pollock Rip, located at the eastern entrance to Vineyard Sound, is $5\frac{1}{4}^{\circ}$ lower than at Vineyard Sound light-ship, at the southwestern entrance to the same body of water.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	Janu- ary.	Febru- ary.	March.	April.	May.	June.	July.	August.	Septem- ber.	October.	Novem- ber.	Decem- ber.
Northeast	4.5	5.4	5.7	6.6	9.9	4.3	4	6.7	9.4	10.8	6.8	5.1
Southeast	5.3	3.9	4.1	4.1	5.1	5.9	6	5.7	6.2	4.7	3.1	4.4
Southwest	7.7	8	10	10.5	9.9	14.6	15.8	12.2	8.5	8.3	9.1	10
Northwest	13.4	10.7	10.7	7.6	4.2	4	3.3	3.5	4.5	5.9	10	10.2

OCEAN TEMPERATURE CHART No. 19

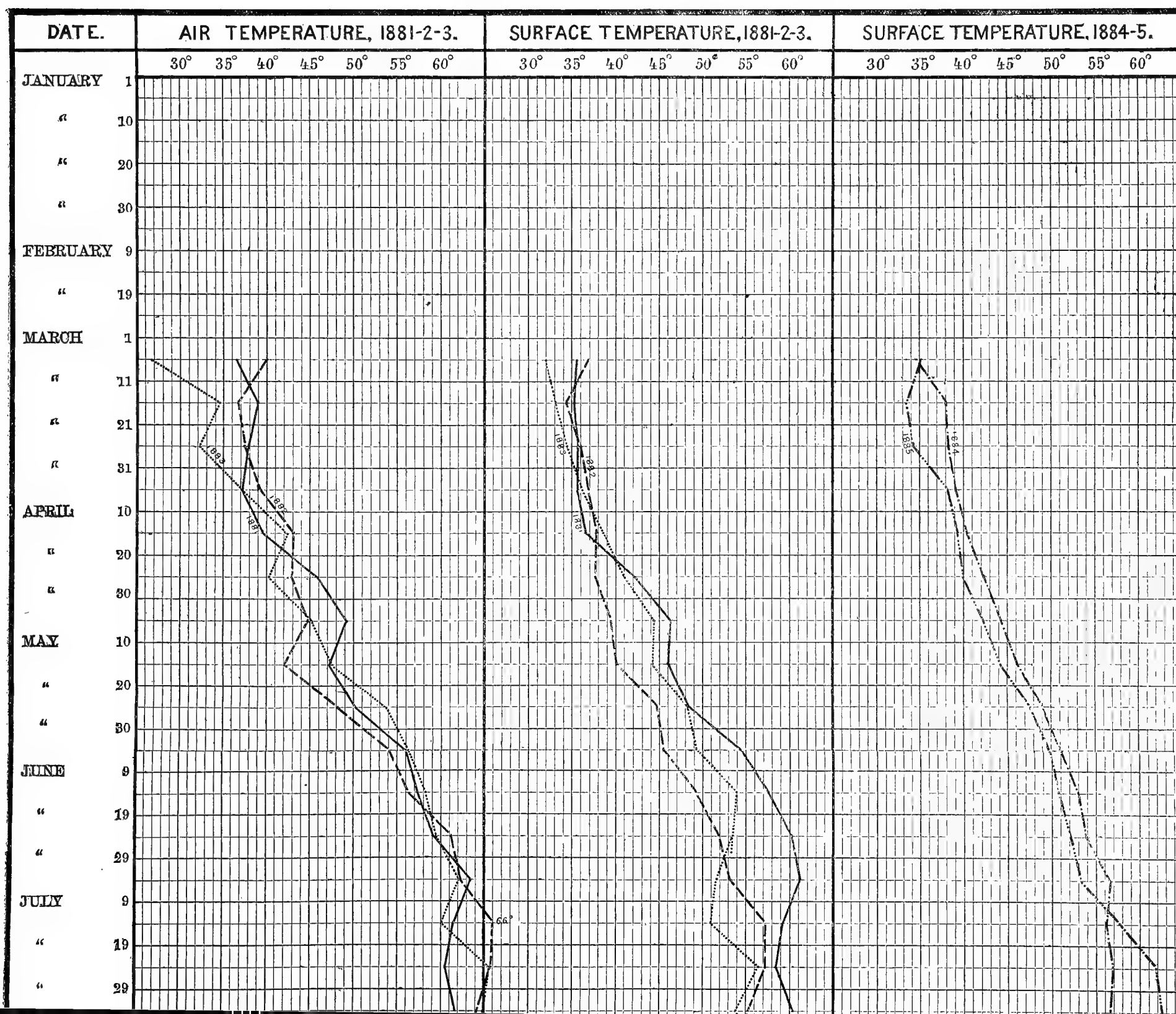
By RICHARD RATHBUN.

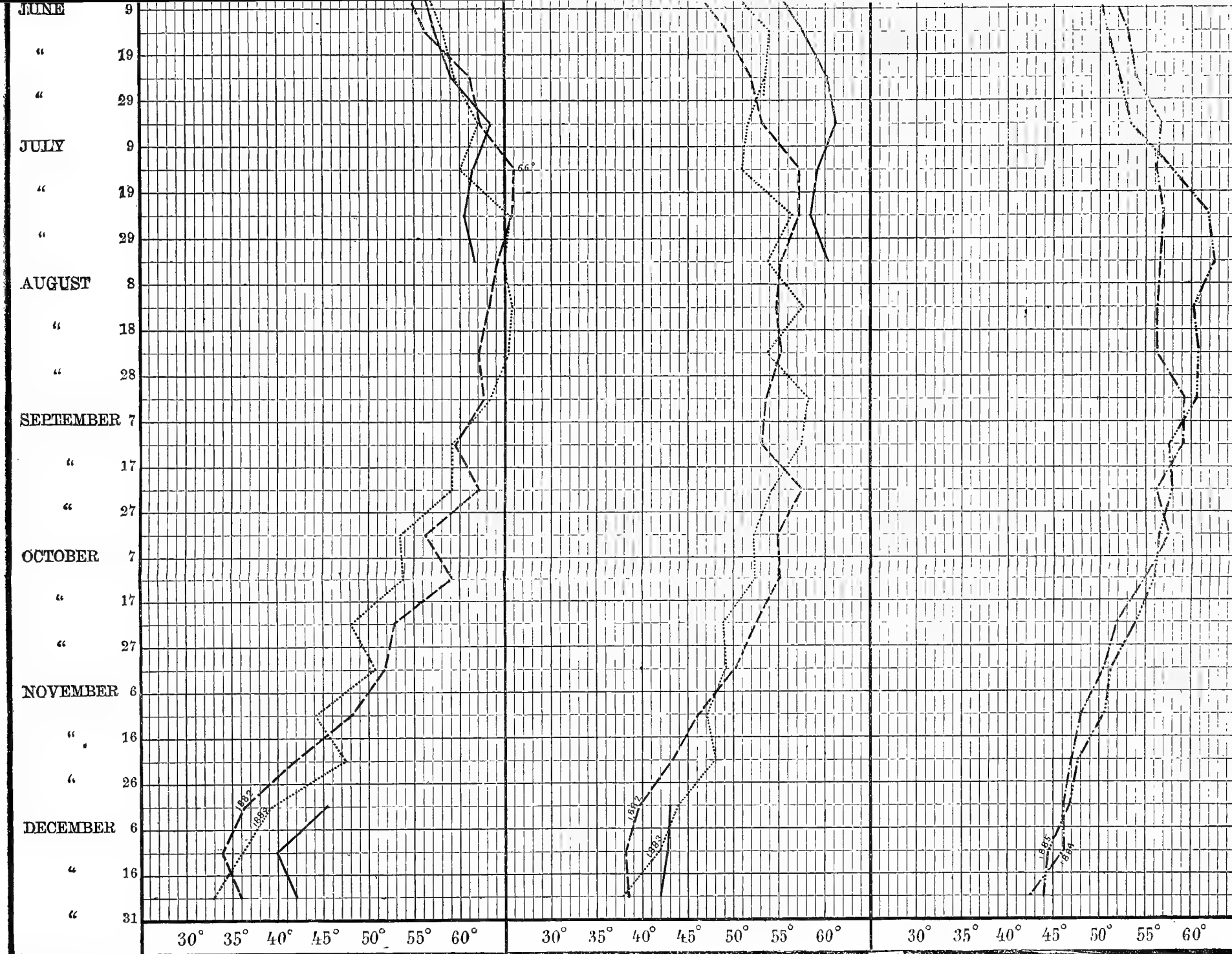
Station: Pollock Rip Light Ship, Massachusetts.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, — — — 1882, 1883, -.-.- 1884, - - - - 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 20.

THATCHER'S ISLAND LIGHTS, MASSACHUSETTS.

Observers: E. C. GOSS, O. B. COLE, G. LAEBMANN, of the U. S. Signal Service.

Location of station.—The Cape Ann lights are located on Thatcher's Island, about three-fourths of a mile off the eastern extremity of Cape Ann, both being on the outer side of the island. There are several rocky ledges in front of the island, but otherwise depths of $3\frac{1}{4}$ to 24 fathoms occur within a distance of 1 mile. A depth of 60 fathoms is reached $5\frac{1}{2}$ miles to the eastward. Thatcher's Island is about 73 miles northwesterly from Pollock Rip light-ship.

Geographical position.—The northern light is located in latitude $42^{\circ} 38' 21''$ N. ; longitude, $70^{\circ} 34' 31''$ W.

Depth of water.—Seven feet.

Range of temperature (twelve months).—Air, $48^{\circ}.5$ (30° to $78^{\circ}.5$); surface, 32° (35° to 67°).

The observations at this station were taken by trained observers of the Signal Service, and the winter records, although covering only two years, are presumably accurate, and have been plotted. Observations were continued through only three years, and there are many gaps within that period, which is very unfortunate, considering the important geographical position of the station. Only one observation was taken daily, at 2 p. m. The surface curves are very irregular, and in many cases, especially during the warmer months, indicate direct atmospheric influence, from the similarity of the variations in both the air and surface curves. There is not always, however, a strict correspondence in the relative positions of the curves in different years, the air curve from May to July, 1883, being from 2° to 10° higher than the air curve for the same months in 1881, while the surface curve for a part of the same period, in 1883, is from 2° to 6° lower than in 1881. During the colder months the surface curves are very regular.

The maximum air temperature is higher at Thatcher's Island than at any of the preceding stations as far south as Block Island, with which latter this station corresponds approximately. In surface temperatures Thatcher's Island agrees most closely with Vineyard Sound and Brenton's Reef light-ships, but it is probable that the higher surface temperatures of Thatcher's Island are due to the observations having been taken in a sheltered place.

OCEAN TEMPERATURE CHART No. 20

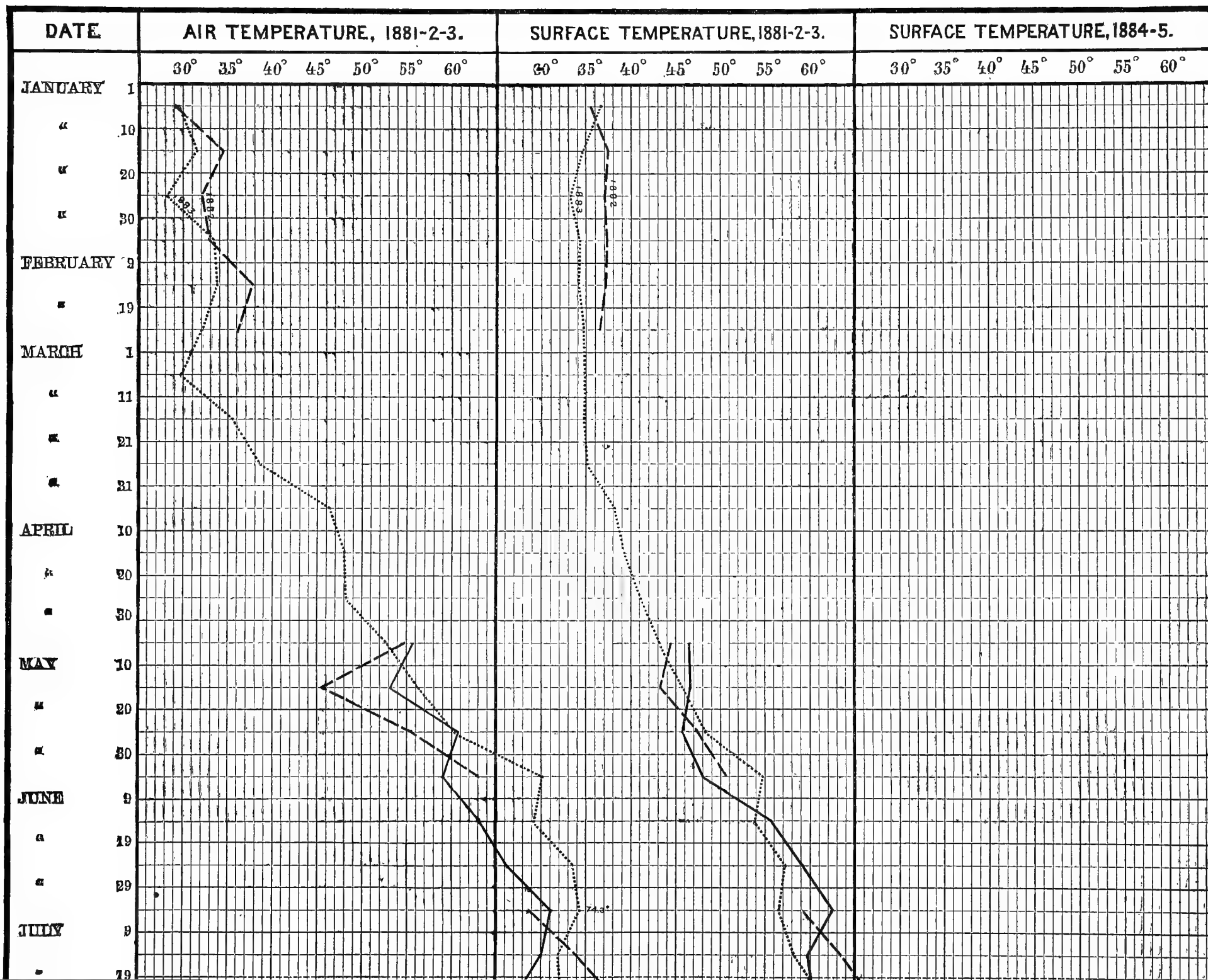
By RICHARD RATHBUN.

Station: Thatcher's Island Lights, Massachusetts.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1883, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, - - - 1882, 1883, — — — 1884, — · — · — 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 21.

BOON ISLAND LIGHT-HOUSE, MAINE.

Observer: ALFRED J. LEAVITT.

Location of station.—Boon Island is a small, low, rocky island, off York Harbor, Maine, and $5\frac{1}{4}$ miles from Cape Neddick, the nearest part of the mainland. From Thatcher's Island it is distant about 35 miles, in a northerly direction. Within a radius of 1 mile depths of $5\frac{1}{4}$ to 25 fathoms occur, and a depth of 60 fathoms is reached at a distance of about $6\frac{1}{4}$ miles to the eastward and southeastward.

Geographical position of the light-house.—Latitude, $43^{\circ} 07' 17''$ N. ; longitude, $70^{\circ} 28' 37''$ W.

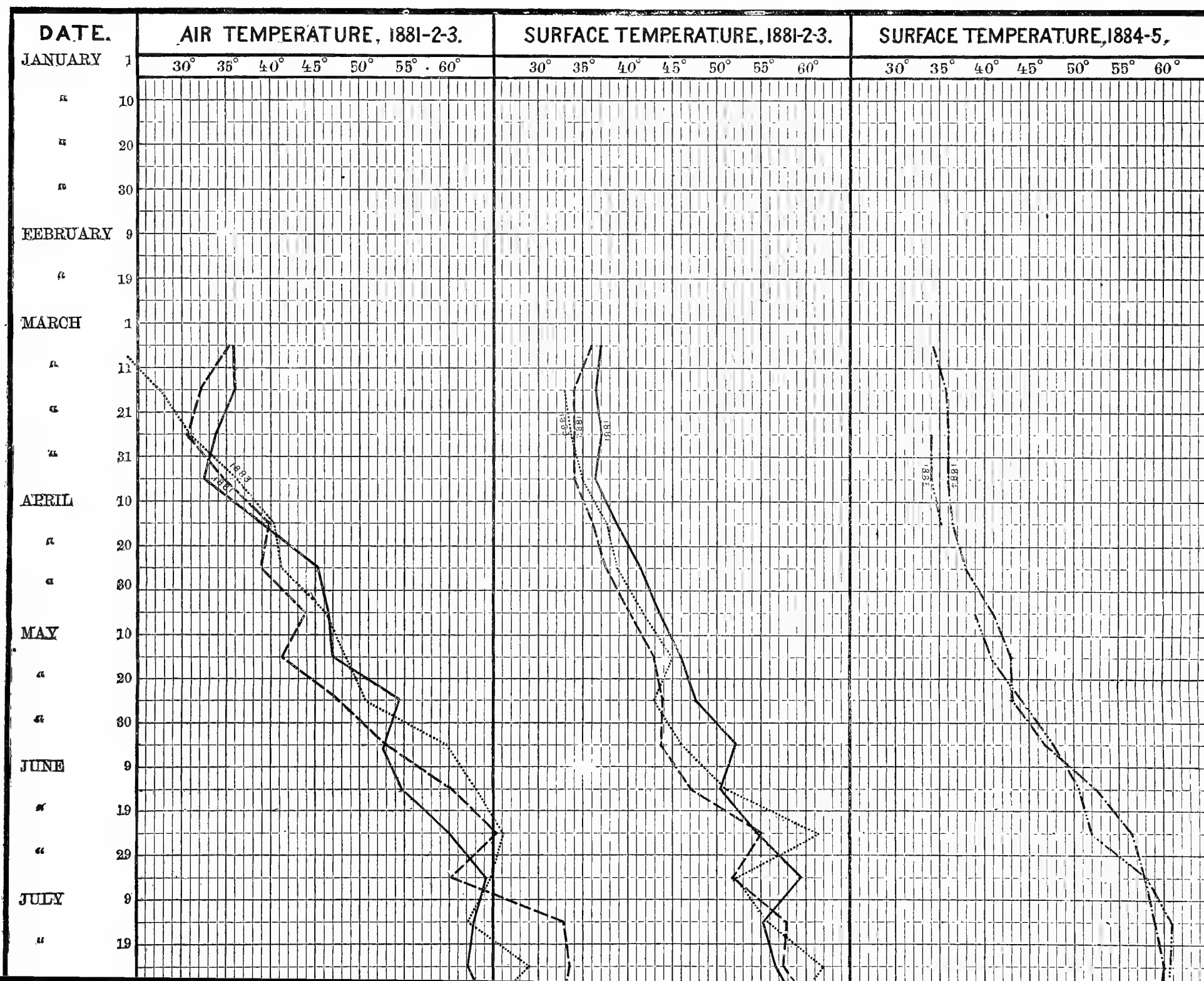
Depth of water.—Nine fathoms.

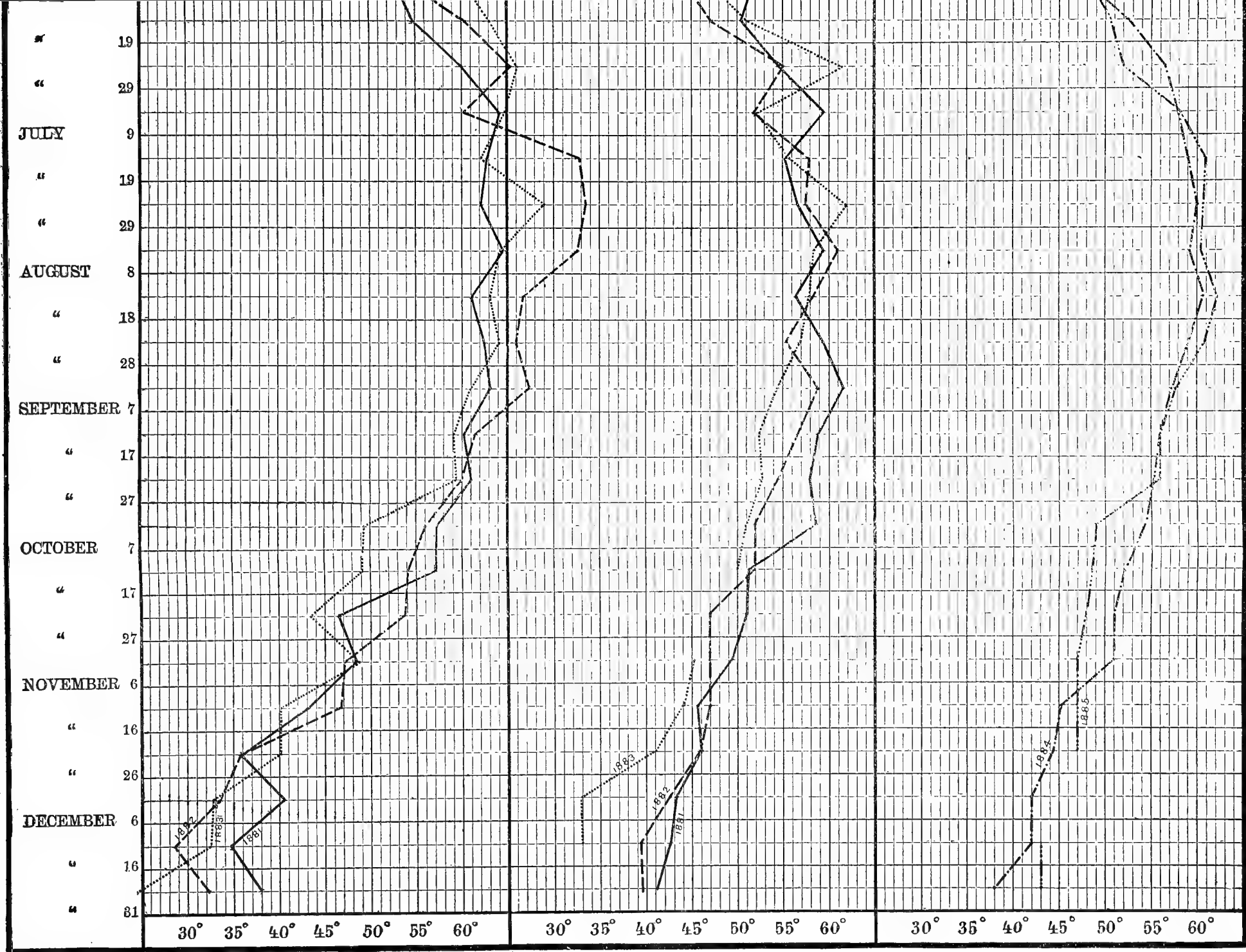
Range of temperature (March 1 to January 1).—Air, 51° ($22^{\circ}.5$ to $73^{\circ}.5$) ; surface, 29° (33° to 62°).

This station affords the highest maximum surface temperature of any of the stations located in the northern part of the Gulf of Maine. This maximum is 5° lower than at Thatcher's Island, but agrees exactly with the surface maximums at Pollock Rip and Nantucket New South Shoal. The maximum for the air is, however, somewhat higher at Boon Island than at the two light-ships mentioned. The surface curves are more irregular than at the other stations in the Gulf of Maine. It is necessary to explain, however, that the surface observations were not taken with any regularity at this station, omissions of several days, sometimes as many as five or six days, occurring in a majority of the ten-day periods. The omissions are much less frequent during the summer than the winter months. It is impossible to calculate to what extent the results may be vitiated by this fact.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	7.8	9	9.3	9.1	9.9	5.3	5.8	7.5	10	11.4	9.7	8.8
Southeast	3.2	3.6	5.9	8.8	13	13.3	12.9	10	10.1	7.3	4.3	4
Southwest	9	7.2	5.5	3.9	4.5	5.6	7.7	10.5	6	7.7	9.1	9.6
Northwest	10.9	6.4	10.5	8	3.2	4.8	3.8	2.6	3.1	4.2	6.8	8.6





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 22.

SEGUIN ISLAND LIGHT-HOUSE, MAINE.

Observer: THOMAS DAY.

Location of station.—Seguin Island is a small rocky island with precipitous shores, located about $2\frac{1}{2}$ miles off the nearest part of the mainland, on the east side of the entrance to Kennebec River, and about 47 miles northeasterly from Boon Island. Between Seguin Island and the shoals bordering the adjacent mainland depths of $3\frac{1}{2}$ to 9 fathoms occur, and off the island a depth of 40 fathoms is reached within a distance of $3\frac{1}{2}$ miles. The light is placed on the western side of the island where the water is from 6 to 8 fathoms deep close inshore.

Geographical position.—Latitude, $43^{\circ} 42' 26''$ N. ; longitude, $69^{\circ} 45' 32''$ W.

Depth of water.—Six fathoms.

Range of temperature (March 1 to January 1).—Air, $46^{\circ}.5$ (24° to $70^{\circ}.5$); surface, 25° (33° to 58°).

This station has a shorter range of temperature for both the air and surface than Boon Island. The maximum air temperature is 3° , the maximum surface temperature 4° , lower than at Boon Island. Both the air and surface curves are more regular than at the preceding station, and more uniform for all the years.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	Febru- ary.	March.	April.	May.	June.	July.	August.	Septem- ber.	October.	Novem- ber.	Decem- ber.
Northeast	7.4	7.6	9	6.5	9.3	4.9	3.9	4.9	7.9	8.6	8.4	7
Southeast	2.1	3.1	4.3	5.4	8.8	6.8	7.4	7.5	4.7	4.5	1.8	2.9
Southwest	9.5	7.8	8	8.6	9.2	13.8	15.6	14.2	11.8	14.4	10.1	10.7
Northwest	11.6	8.8	9.2	8.6	2.9	3.4	3.2	3.4	4.4	6.1	9	9.7

OCEAN TEMPERATURE CHART No. 22

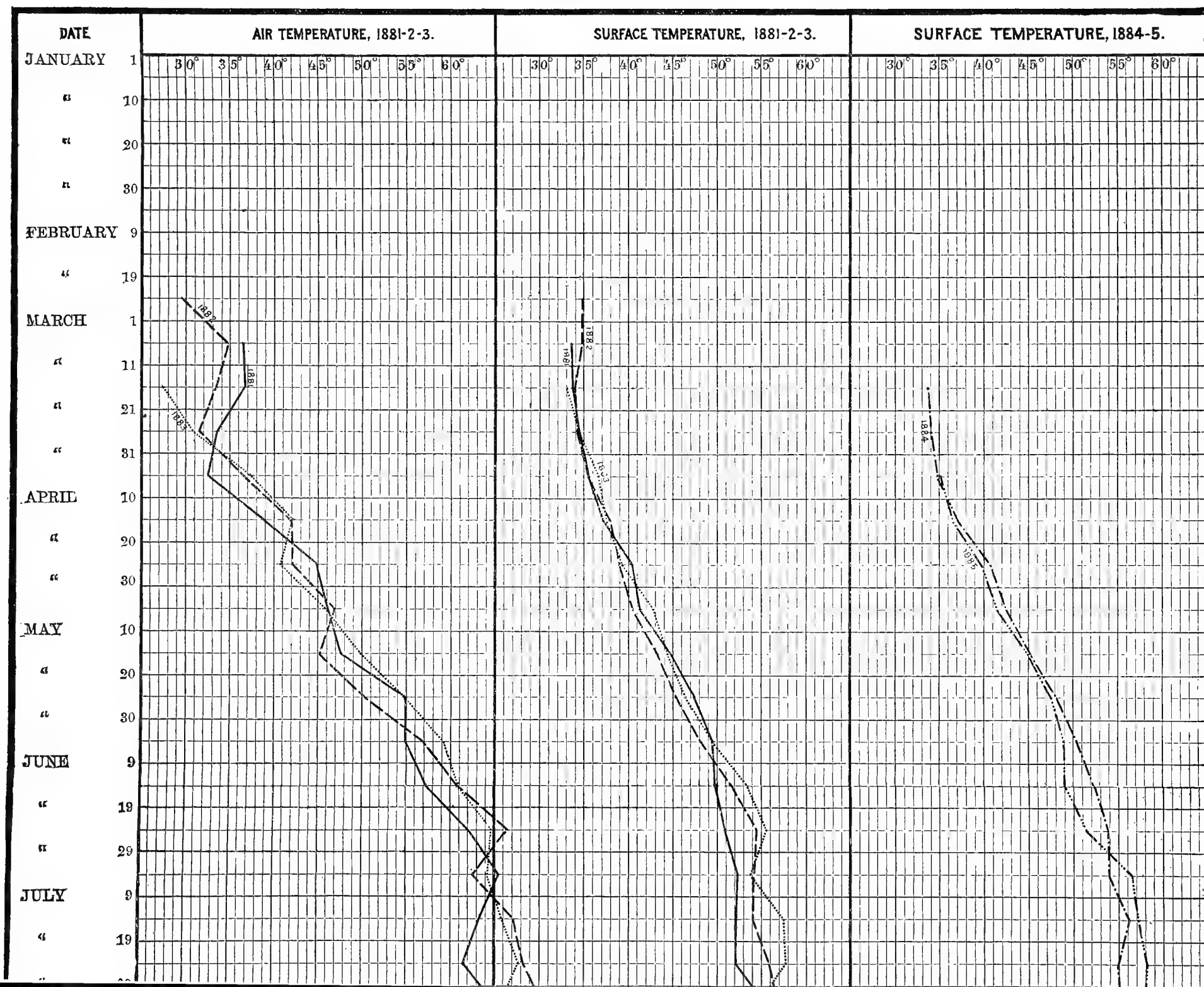
By RICHARD RATHBUN.

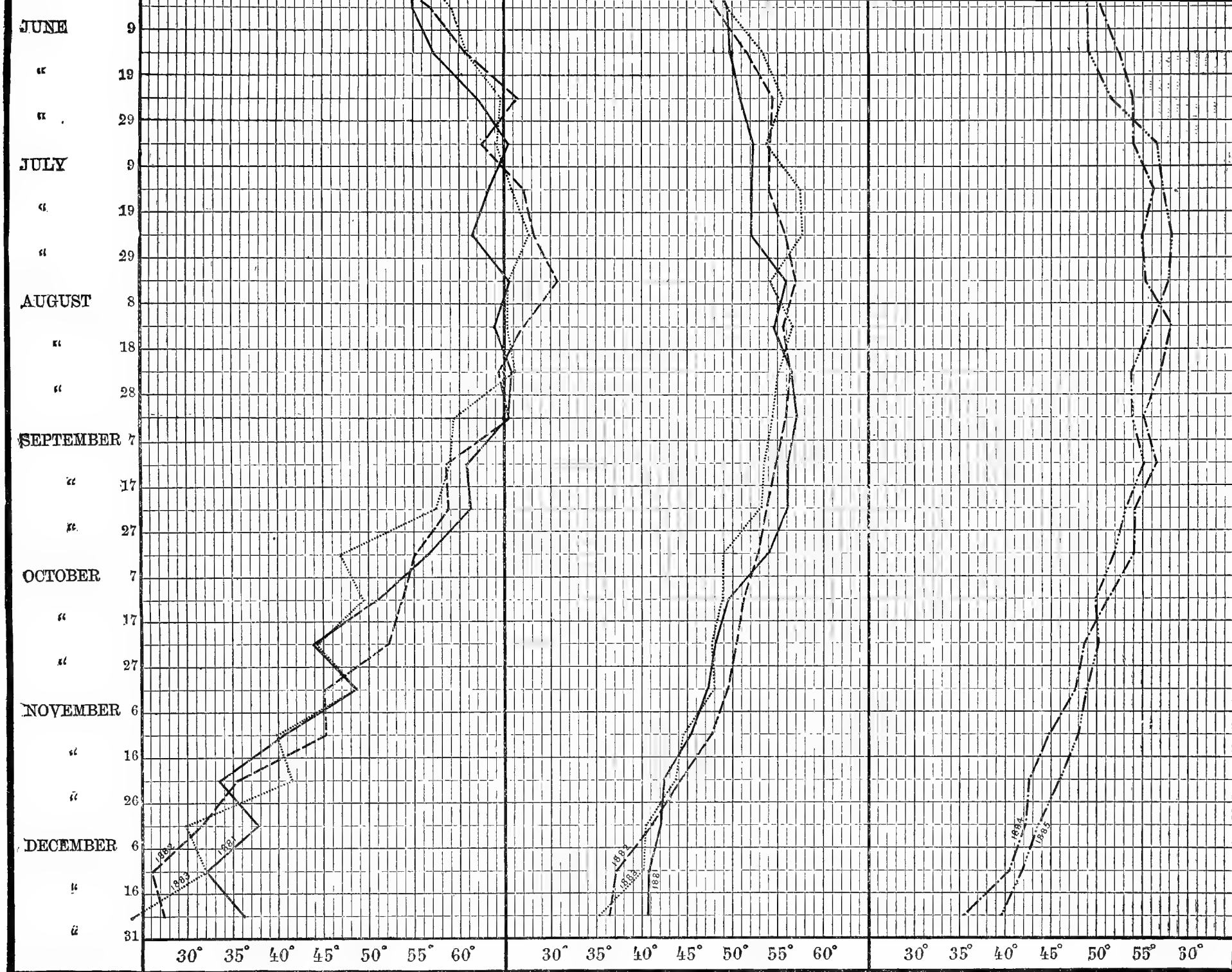
Station: Seguin Island Light House, Maine.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1882 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881. - - - 1882, 1883, - . - 1884, — . . . 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 23.

MATINICUS ROCK LIGHT-HOUSE, MAINE.

Observer: WILLIAM G. GRANT.

Location of station—Matinicus Rock is a bare, rocky islet, about 80 miles easterly from Seguin Island, and about 14 miles south of Vinal Haven Island, at the mouth of Penobscot Bay, the nearest large piece of land. It is about 2½ miles SE. of Ragged Island, which is close to Matinicus Island and between the latter and Matinicus Rock. Within a radius of a mile the water deepens rapidly from 4 to 45 fathoms.

Geographical position.—Latitude, 43° 47' 01" N.; longitude, 68° 51' 20" W.

Depth of water.—Six to 12 fathoms.

Range of temperature (March 1 to January 1).—Air, 42° (23° to 65°); surface, 21° 5 (32° 5 to 54°).

Matinicus Rock and Mount Desert Rock present the shortest range of surface temperature of any of the stations north of the Florida Reefs, being 7° shorter than at Nantucket New South Shoal light-ship. The surface and air maximums for Matinicus Rock are also the lowest of any recorded. The surface curves are very regular and uniform from year to year. Unfortunately, there are nearly as many omissions in the surface records for this station as for Boon Island, but they are seldom frequent except during the colder months.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	3.7	4.6	5.3	6.3	6.6	2.7	2.4	3.7	5.7	6.1	6.1	4.5
Southeast	4.8	4.9	4.8	4.8	9.6	8.5	9.4	7.3	6	5.8	3.7	5.5
Southwest	9.1	6.4	7.4	8	9.2	12.8	13.9	12.9	10.2	10	10.3	8.2
Northwest	12.9	11.7	13.5	7.9	4.3	4.4	2.9	3.4	5.1	8.6	9.7	12.3

OCEAN TEMPERATURE CHART No. 23

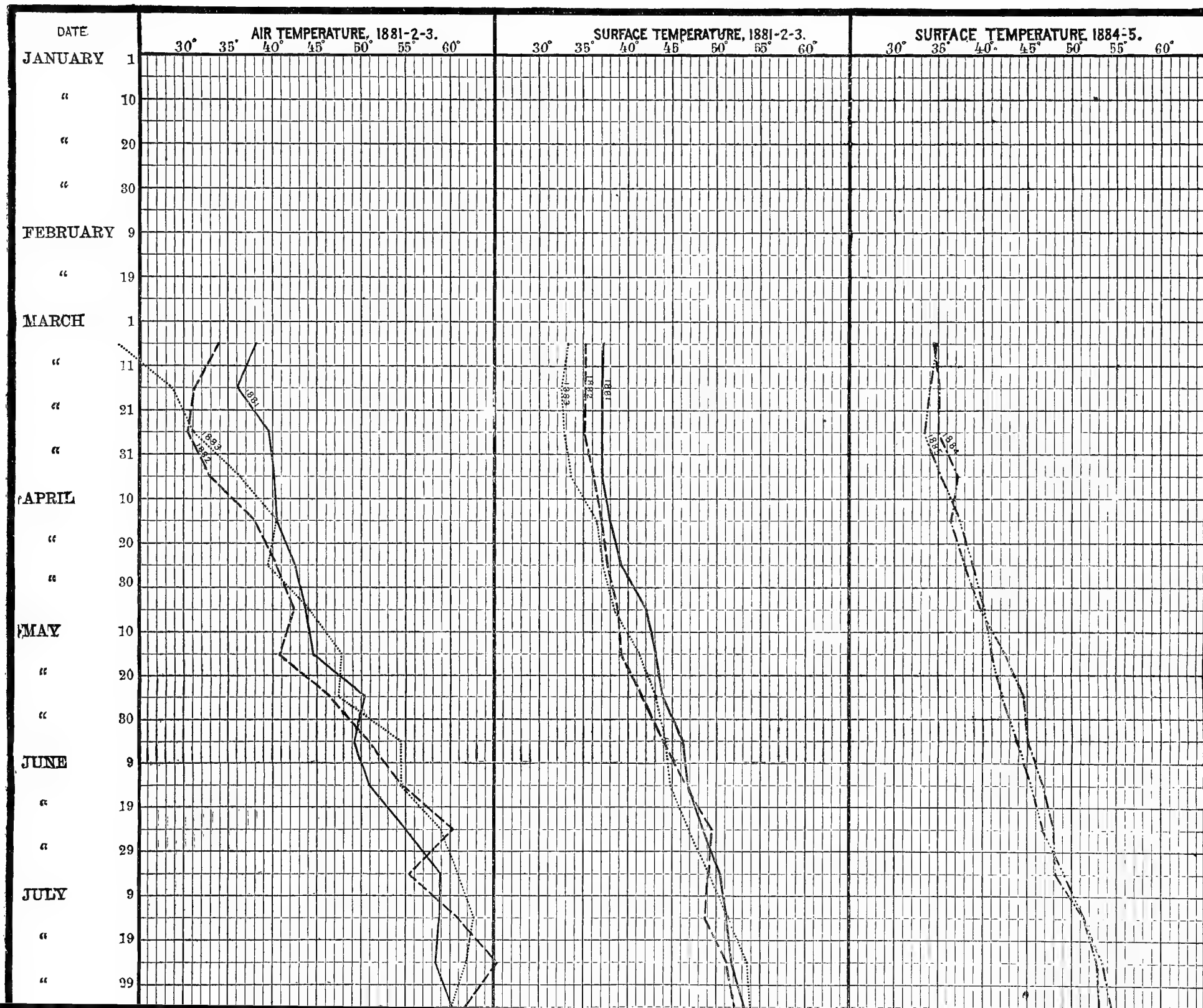
By RICHARD RATHBUN.

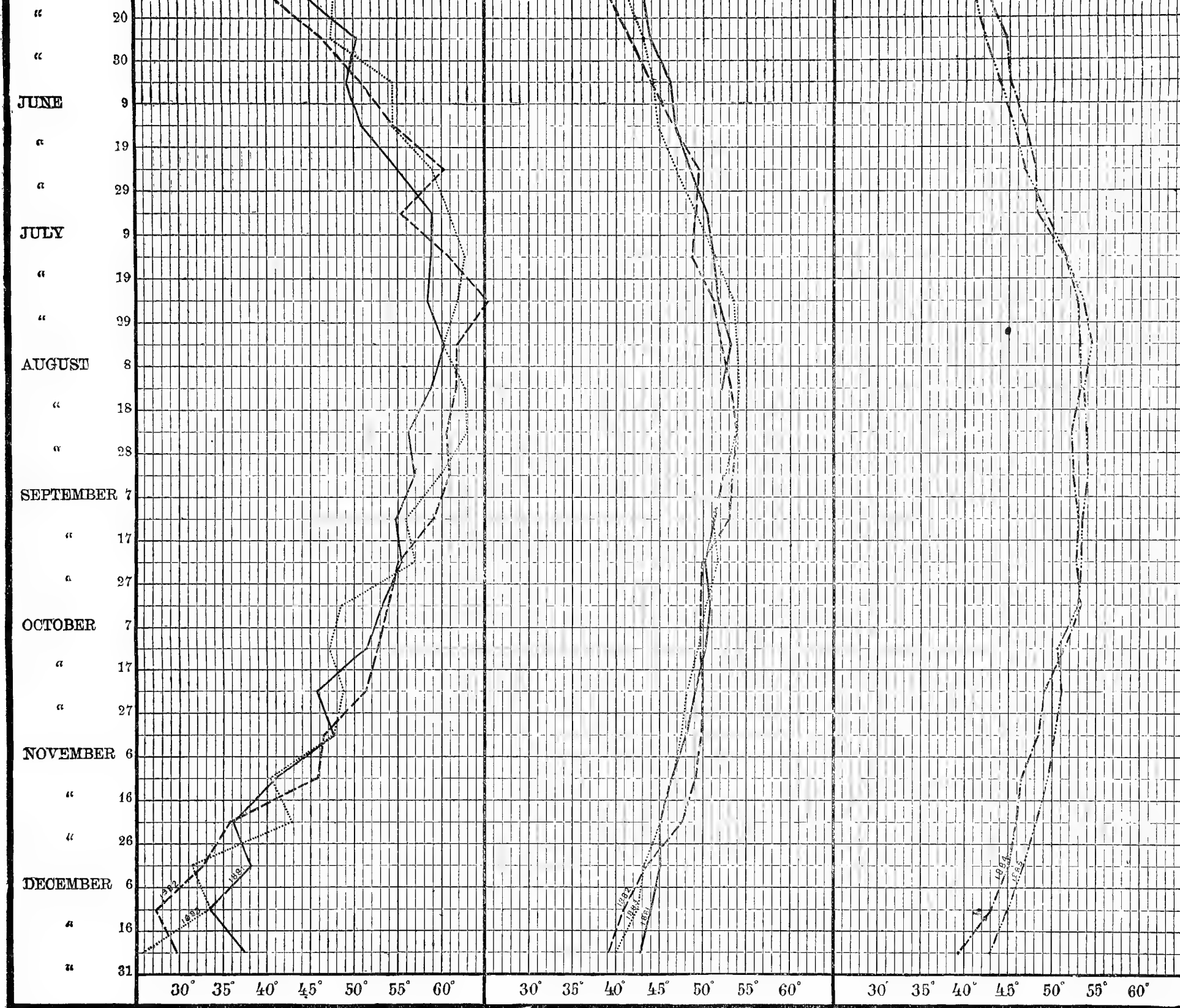
Station: Matinicus Rock Light House, Maine.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, - - - 1882, 1883, - - - 1884, - - - 1885.

(ISSUED IN 1886)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 24.

MOUNT DESERT ROCK LIGHT-HOUSE, MAINE.

Observers : AMOS B. NEWMAN, JAMES A. MORRIS, THOMAS MILAN.

Location of station.—Mount Desert Rock is a small, barren islet, 34 miles E. $\frac{3}{4}$ N. from Matinicus Rock, and about 18 miles off Mount Desert Island. The rock is surrounded with deep water, the depths ranging from 50 to 95 fathoms within a radius of 5 miles.

Geographical position.—Latitude, $43^{\circ} 58' 05''$ N.; longitude, $68^{\circ} 07' 44''$ W.

Depth of water.—Two to 10 fathoms.

Range of temperature (March 1 to January 1).—Air, 50° ($25^{\circ}.5$ to $75^{\circ}.5$); surface, $21^{\circ}.5$ (33° to $54^{\circ}.5$).

This station presents the same surface range as Matinicus Rock, with practically the same maximum and minimum temperatures, but the surface curves are less regular and not uniform for all the years (especially from 1881 to 1883, inclusive), sometimes showing differences of 10° to 12° in corresponding periods. The maximum air temperature is 2° higher than at any other station in the Gulf of Maine, excepting Thatcher's Island, Brenton's Reef light-ship being the first station to the south with which it corresponds closely in this respect. The maximum air temperature at Matinicus Rock, the nearest station to the west, is 10° lower than at Mount Desert Rock. Excluding, however, the year 1883, in which the summer temperature was far above those of the two previous years, the maximum air temperature of this station would be only $68^{\circ}.5$.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	4.9	5.6	7.2	5.4	7.1	2.5	1.7	3	5.5	5.7	6.8	5.3
Southeast	4.5	4.9	6.8	5.3	8.3	8.9	9.9	7.3	6.9	7.1	5.7	7.1
Southwest	8.5	8	7.1	10.1	10.9	13.3	14.3	14	10.6	9.8	9.7	8.7
Northwest	12.9	9.4	9.6	7	3	3	2	3.1	4.1	6.6	7.5	9.6

OCEAN TEMPERATURE CHART No. 24

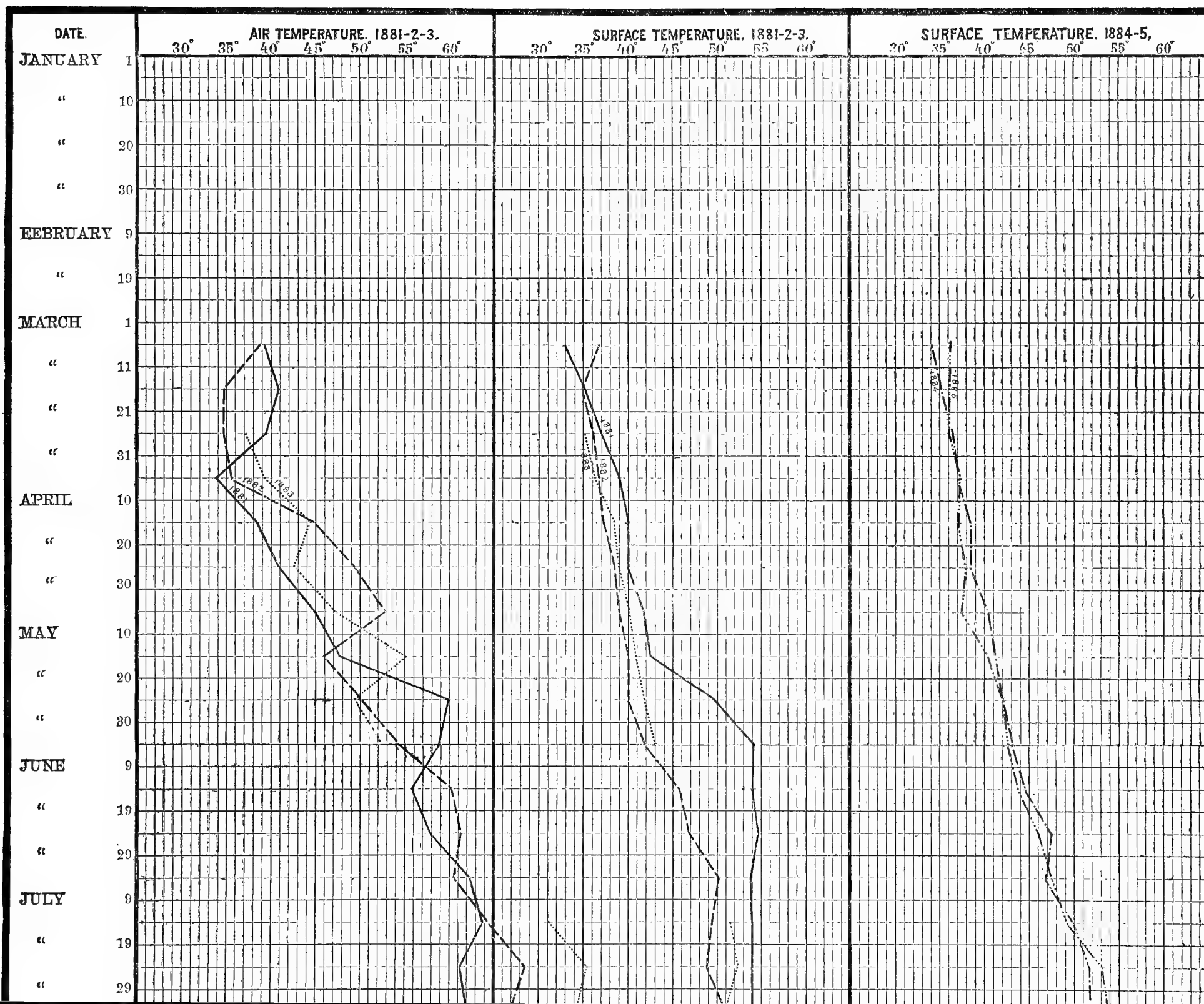
By RICHARD RATHBUN.

Station: Mount Desert Rock Light House, Maine.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, ——— 1882, 1883, ——— 1884, ——— 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 25.

PETIT MANAN LIGHT-HOUSE, MAINE.

Observer: GEORGE L. UPTON.

Location of station.—Petit Manan light-house is located on the southernmost of a group of low, rocky islets, known, collectively, as Petit Manan Island. These islets are situated off the western entrance to Pigeon Hill Bay, near Gouldsborough, Me., and are distant about 2 miles from the nearest point of the mainland. They are immediately surrounded by ledges and shoals, but within a distance of 8 miles to the southward depths of 60 fathoms occur. The light is 27 miles NE. $\frac{1}{4}$ N. from Mount Desert Rock light-house.

Geographical position.—Latitude, $44^{\circ} 22' 03''$ N.; longitude, $67^{\circ} 51' 51''$ W.

Depth of water.—Eight to 15 fathoms.

Range of temperature (March 1 to January 1).—Air, 50° (20° to 70°); surface, $27^{\circ}.5$ (31° to $58^{\circ}.5$).

The range of air temperature is the same as at Mount Desert Rock, but with the maximum and minimum temperatures each $5\frac{1}{2}$ degrees lower. Excluding the year 1883, the maximums of air temperature would be nearly the same at both places. The surface maximum is 4 degrees higher at this station. The surface curves for 1881 to 1883, inclusive, are fully as irregular as at Mount Desert Rock, and there is the same lack of uniformity between the different years, but the variations do not in any way correspond at the two stations, and the conditions by which they were produced were evidently not common to both. There is much greater correspondence between the years 1884 and 1885.

Table showing the direction of the winds, by quadrants, for each month of the year, being the means of five years' observations.

Quadrant.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Northeast	5.5	5	8.6	6.8	8.5	3.7	3	3.8	5.5	5.6	6.4	4.3
Southeast	3.6	6	6	5.7	10.5	11.1	14.3	13.6	9.2	8.9	6.3	7.2
Southwest	9.5	7.3	9.2	10.7	8.4	11.8	11.4	11.3	10.9	7.4	9.6	7.9
Northwest	12.4	9.9	7.2	6.8	3.6	3.4	1.8	2.3	4.3	9.1	7.7	11.6

OCEAN TEMPERATURE CHART No. 25

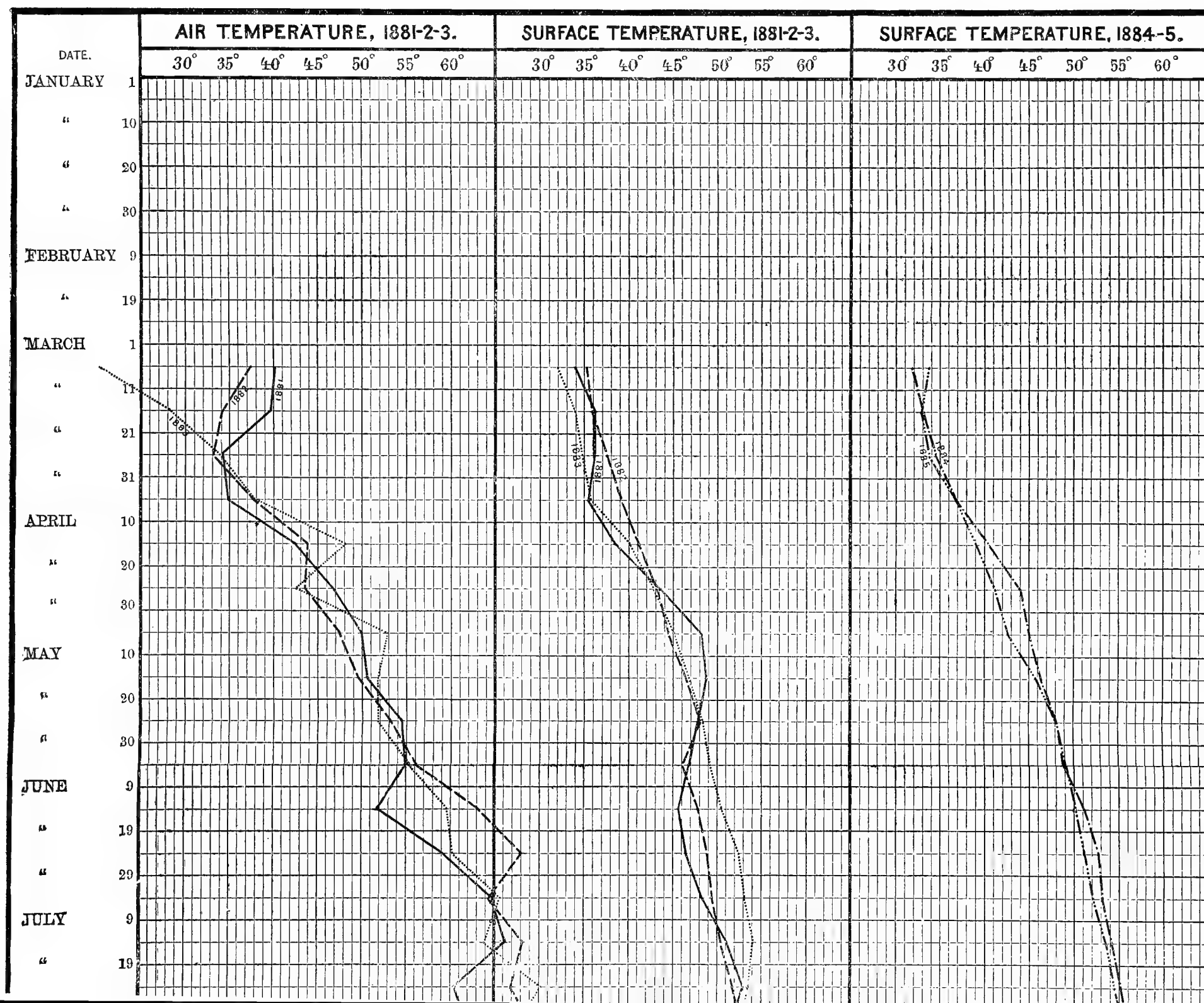
By RICHARD RATHBUN.

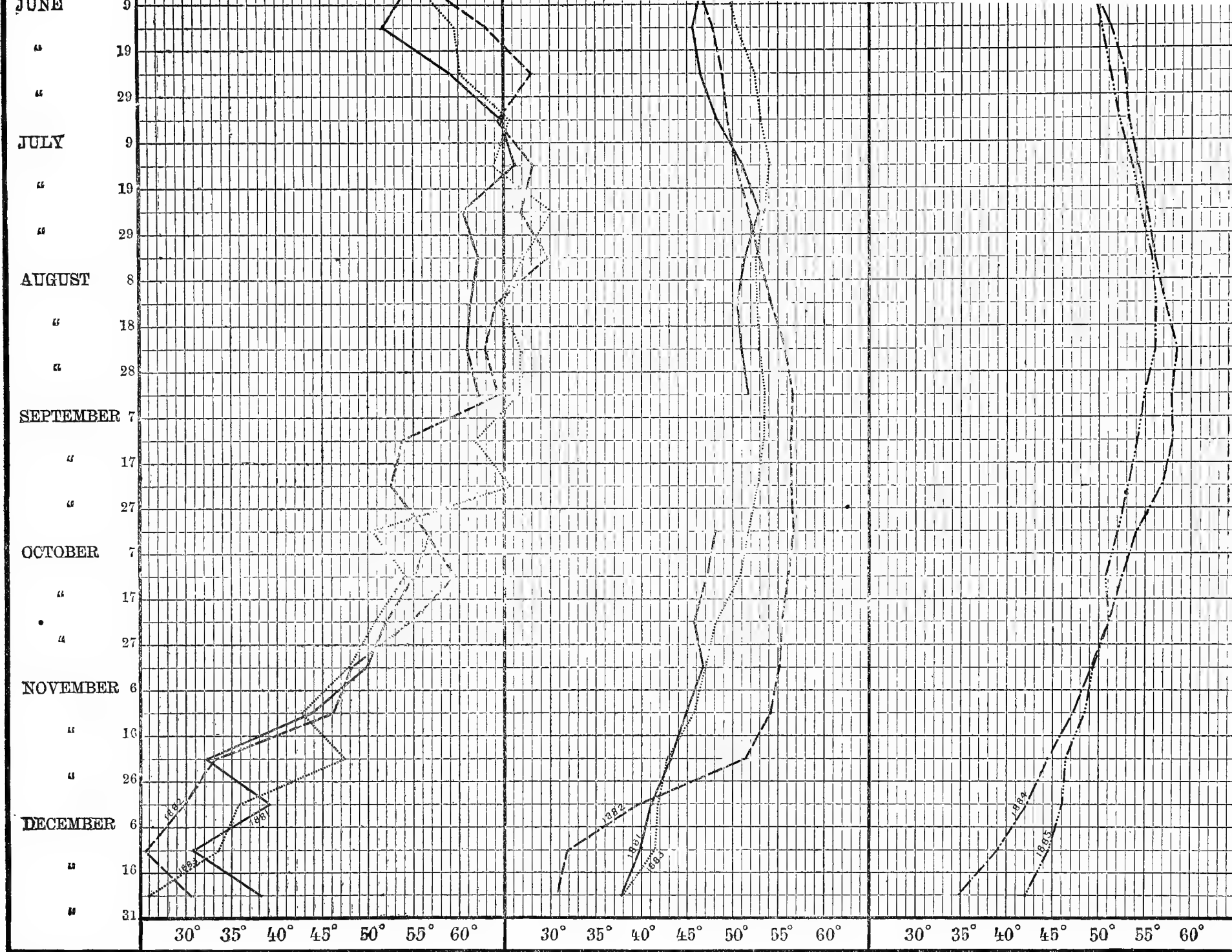
Station: Petit Manan Light House, Maine.

Representing, by means of curves, the temperature of the air from 1881 to 1883, inclusive, and of the water at the surface from 1881 to 1885, inclusive, reduced to means of ten days.

EXPLANATION OF THE CURVES: ——— 1881, — — — 1882, 1883, — — — 1884, — — — 1885.

(ISSUED IN 1886.)





Each vertical interspace represents one degree Fahrenheit, and the fractional parts of a degree are indicated as exactly as possible in the plotting of the curves. Each fifth degree is represented by a slightly heavier line. The transverse interspaces inclosed by the heavier lines represent periods of ten days each, as indicated by the dates on the left-hand side of the plate. The lighter transverse lines, intermediate between the heavier ones, are intended to represent the mean of each ten days, and the curves of temperature are plotted with reference to these lines. The left-hand vertical division is devoted to the air temperatures for 1881, 1882 and 1883, the middle division to the surface water temperatures for the same years, thus permitting of a comparison of the two; and the right-hand division to the water temperatures for 1884 and 1885.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 26.

Isothermal lines connecting the series of light-house stations on the eastern coast of the United States, represented on Chart No. 1, constructed for every 5° of temperature, Fahrenheit, from 40° to 80°, inclusive, for the year 1881.

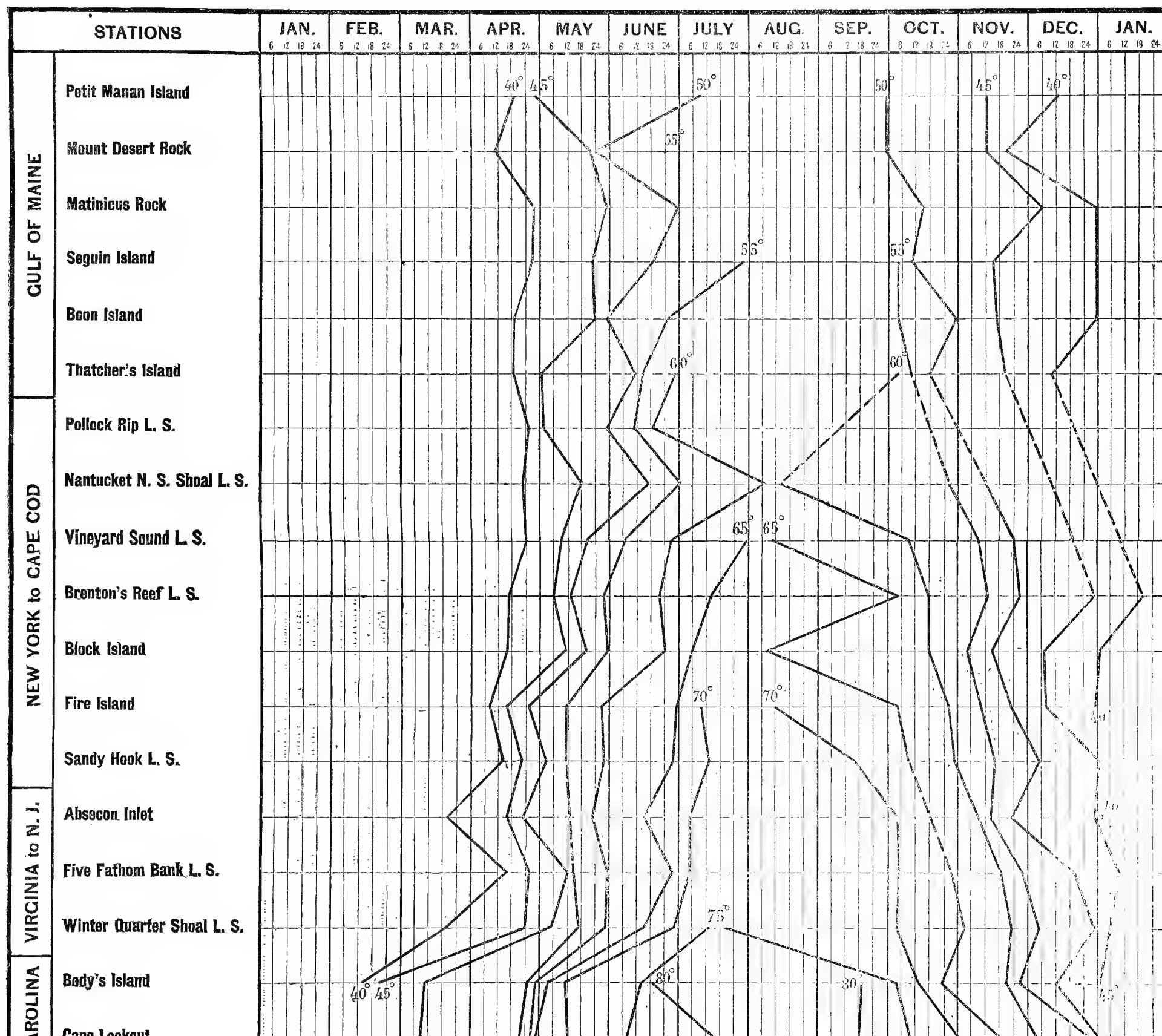
A temperature of 55° was reached at Mount Desert Rock between June 24 and 30, but otherwise the isotherms of 55° extend north only to Seguin Island. At Nantucket New South Shoal, 60° was recorded continuously for eight days only, or from August 7 to 14. Two very short periods of higher temperature than 75° occurred at Absecon Inlet (July 14 to 20, September 30 to October 24), but the isotherms of 75° begin regularly at Winter Quarter Shoal, where the interval between the two lines is only eight days (July 13-20). During the period of falling temperature, the isotherm of 40° extends south continuously within the year to Fire Island, although at Pollock Rip, Nantucket New South Shoal, and Vineyard Sound observations are lacking for that temperature. At Sandy Hook the isotherm of 40° was not reached until February, 1882, while at Five Fathom Bank and Winter Quarter Shoal the temperature remained above 40° during the entire winter of 1881 and 1882. The isotherm of 50° extends south only to Cape Lookout in the same winter, but in the early part of 1881 it reached to Martin's Industry. At the Tortugas the temperature fell below 70° during a short period just prior to February 8, and again between March 20 and April 15.

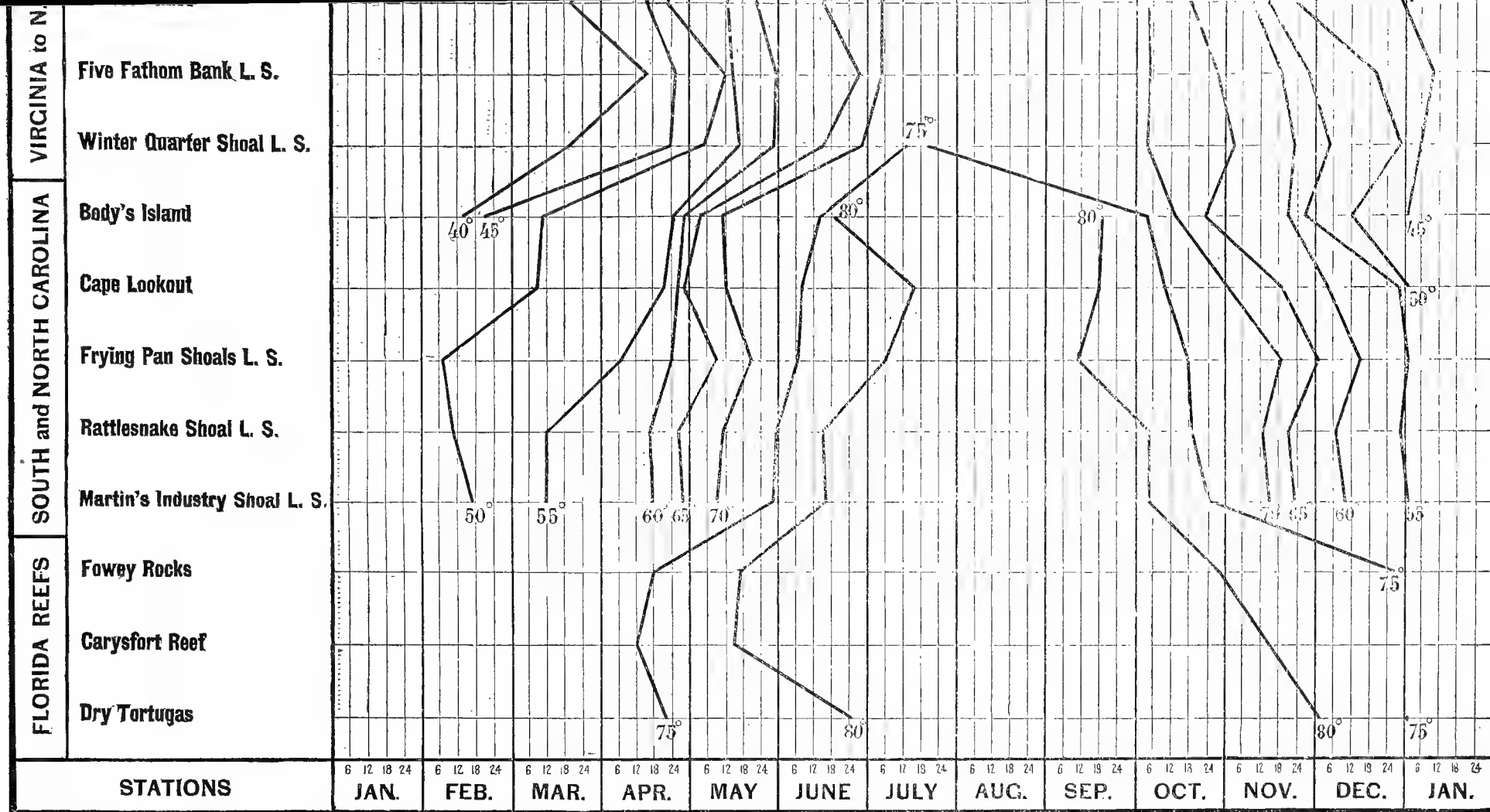
OCEAN TEMPERATURE CHART No. 26

By RICHARD RATHBUN.

Isothermal lines connecting the series of Light House Stations represented on Chart No. 1, constructed for every five degrees of temperature, Fahrenheit, from 40 degrees to 80 degrees, inclusive, for the year 1881.

(ISSUED IN 1886.)





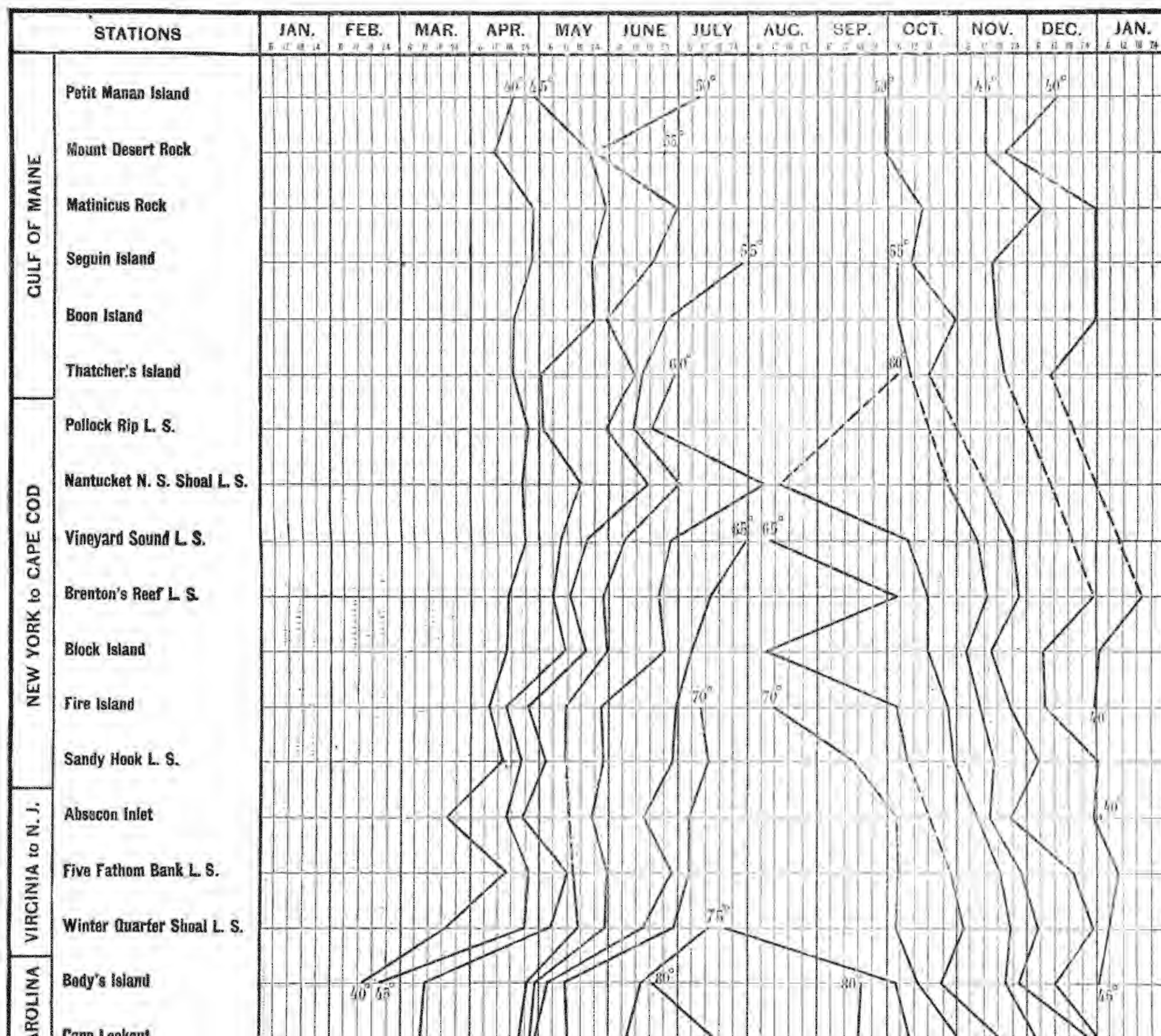
This chart is divided vertically into thirteen months in order to include the first month of the following year. Each month is further divided, by the lighter lines, into periods of six days each, except in the case of those months having fewer or more days than 30, when the last division of the month may equal four, five, or seven days. The 1st, 6th, 12th, 18th, 24th and last days of the month fall on the vertical lines. The transverse lines represent the stations from which they extend. A complete break in the isothermal line opposite any station generally indicates that the temperature did not reach the isotherm at that station during the year. A line consisting of dashes denotes a lack of observations for the corresponding station.

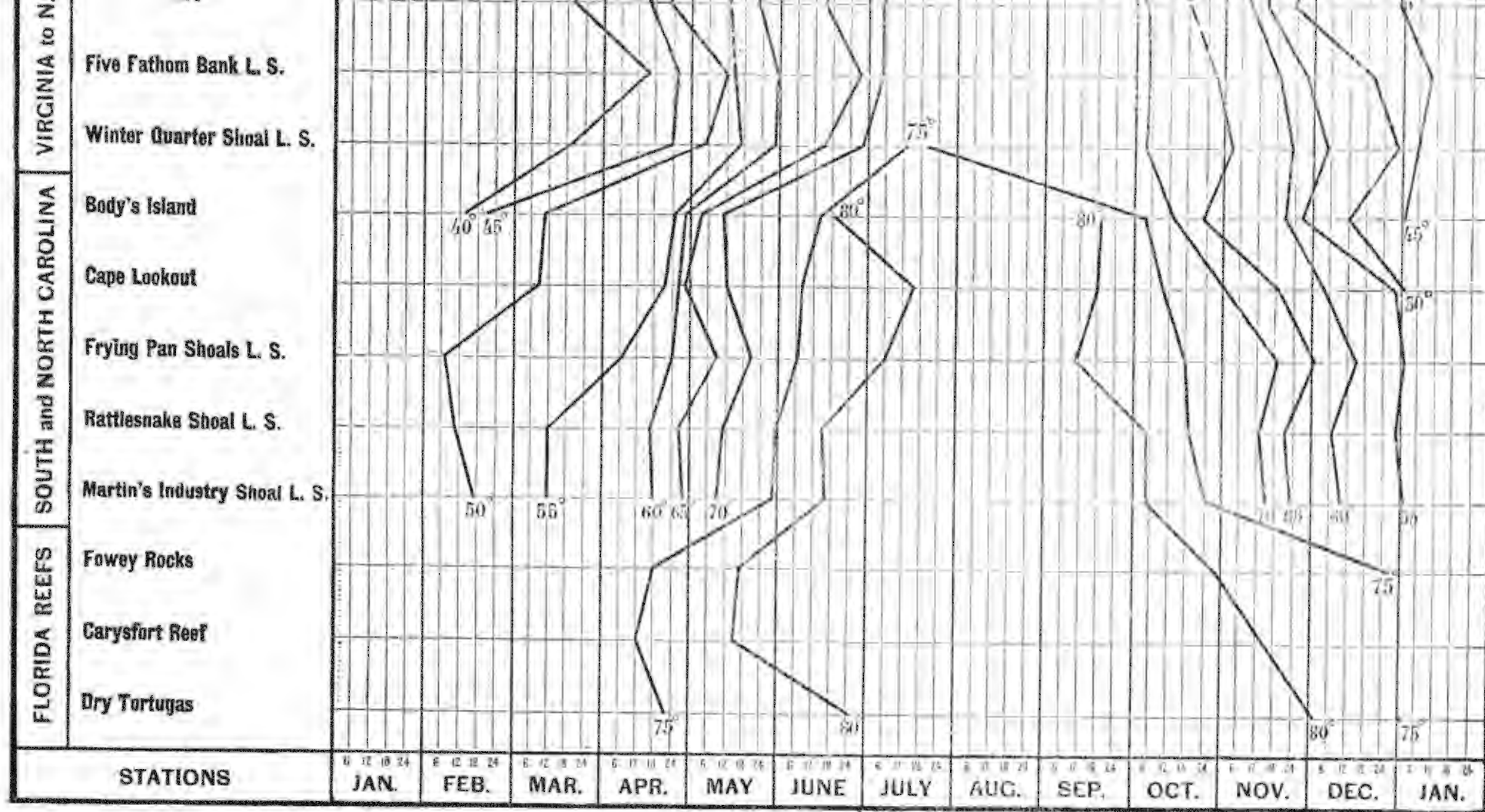
OCEAN TEMPERATURE CHART No. 26

By RICHARD RATHBUN.

Isothermal lines connecting the series of Light House Stations represented on Chart No. 1, constructed for every five degrees of temperature, Fahrenheit, from 40 degrees to 80 degrees, inclusive, for the year 1881.

(ISSUED IN 1886.)





This chart is divided vertically into thirteen months in order to include the first month of the following year. Each month is further divided, by the lighter lines, into periods of six days each, except in the case of those months having fewer or more days than 30, when the last division of the month may equal four, five, or seven days. The 1st, 6th, 12th, 18th, 24th and last days of the month fall on the vertical lines. The transverse lines represent the stations from which they extend. A complete break in the isothermal line opposite any station generally indicates that the temperature did not reach the isotherm at that station during the year. A line consisting of dashes denotes a lack of observations for the corresponding station.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 27.

Isothermal lines connecting the series of light-house stations on the eastern coast of the United States represented on Chart No. 1, constructed for every 5° of temperature, Fahrenheit, from 40° to 80°, inclusive, for the year 1882.

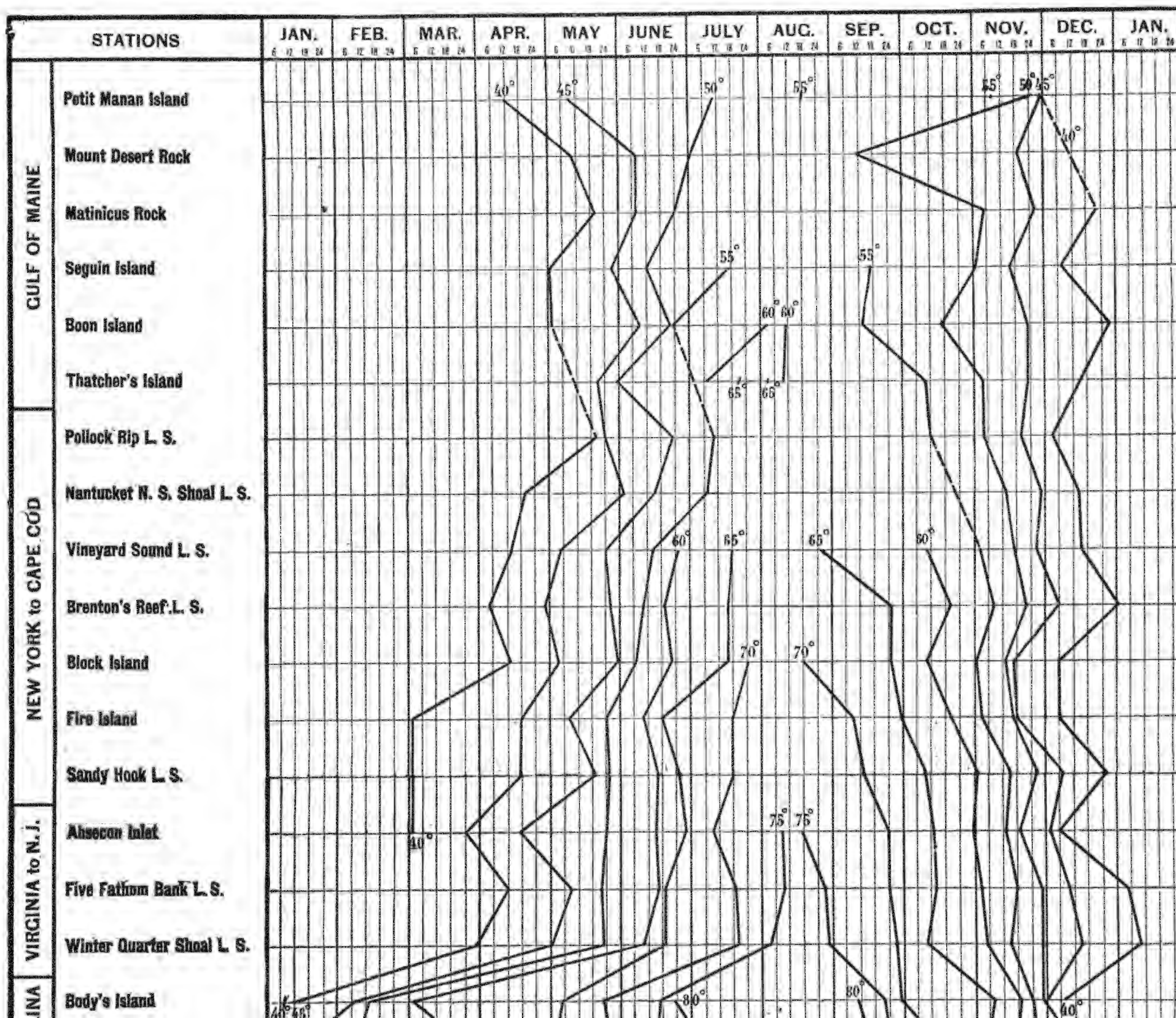
The isotherm of 40° extends south continuously in the spring only as far as Absecon Inlet; during the period of falling temperature, however, the isotherm of that value extends to Body's Island. Higher temperatures than 55° were recorded at Petit Manan, from August 18 to November 8, but the isotherms of 55° begin at Seguin Island. The isotherm of 60° appeared at Boon Island and Thatcher's Island, but not elsewhere north of Vineyard Sound, although the record is incomplete for Nantucket New South Shoal. The isotherms of 65° extend north continuously to Vineyard Sound, and the same temperature was also recorded at Thatcher's Island. At the Tortugas, the temperature was below 75° between May 9 and 21, and below 80° between October 8 and 14.

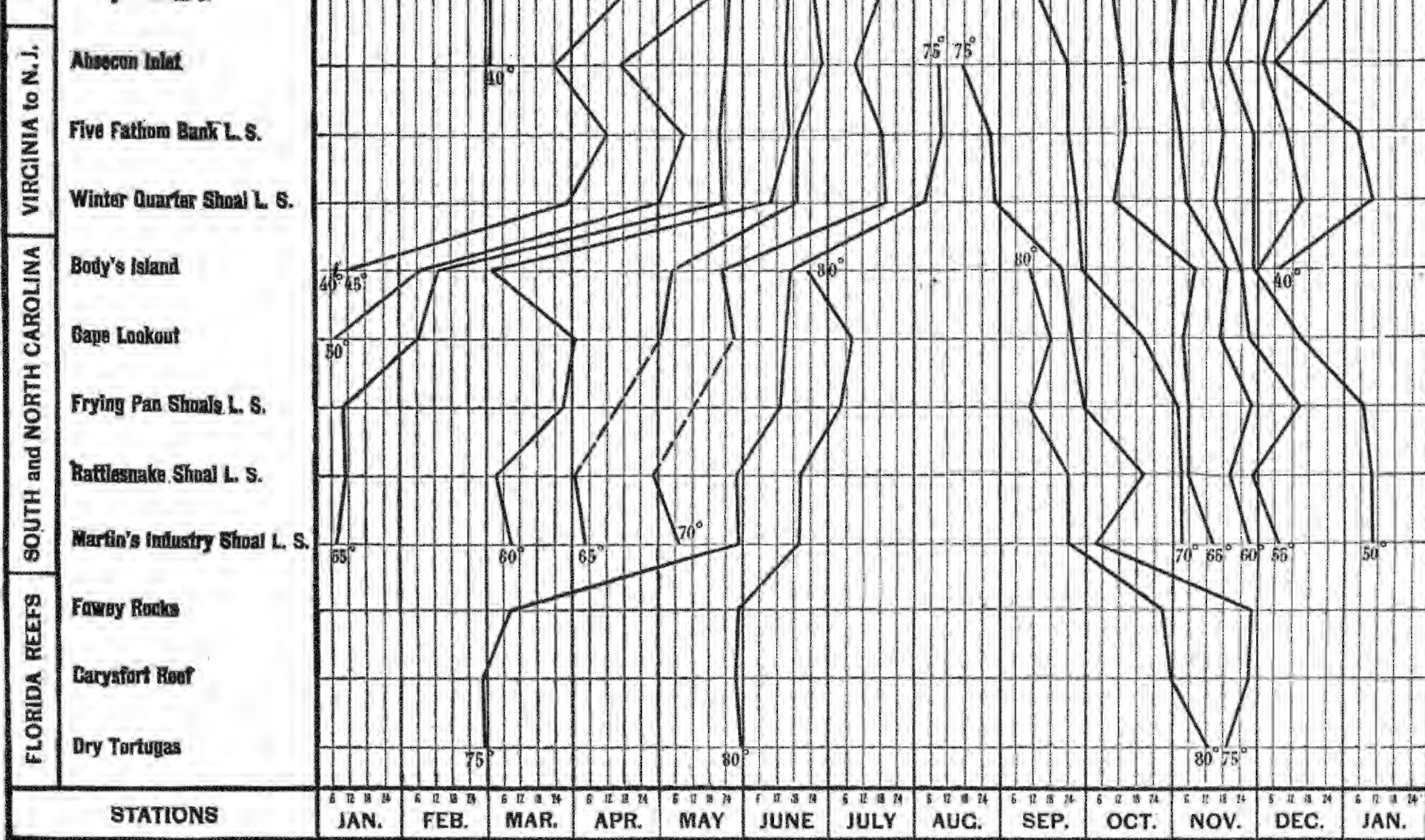
OCEAN TEMPERATURE CHART No. 27

By RICHARD RATHBUN.

Isothermal lines connecting the series of Light House Stations represented on Chart No. 1, constructed for every five degrees of temperature, Fahrenheit, from 40 degrees to 80 degrees, inclusive, for the year 1882.

(ISSUED IN 1886.)





This chart is divided vertically into thirteen months in order to include the first month of the following year. Each month is further divided, by the lighter lines, into periods of six days each, except in the case of those months having fewer or more days than 30, when the last division of the month may equal four, five, or seven days. The 1st, 6th, 12th, 18th, 24th and last days of the month fall on the vertical lines. The transverse lines represent the stations from which they extend. A complete break in the isothermal line opposite any station generally indicates that the temperature did not reach the isotherm at that station during the year. A line consisting of dashes denotes a lack of observations for the corresponding station.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 28.

Isothermal lines connecting the series of light-house stations on the eastern coast of the United States, represented on Chart No. 1, constructed for every 5° of temperature, Fahrenheit, from 40° to 80°, inclusive, for the year 1883.

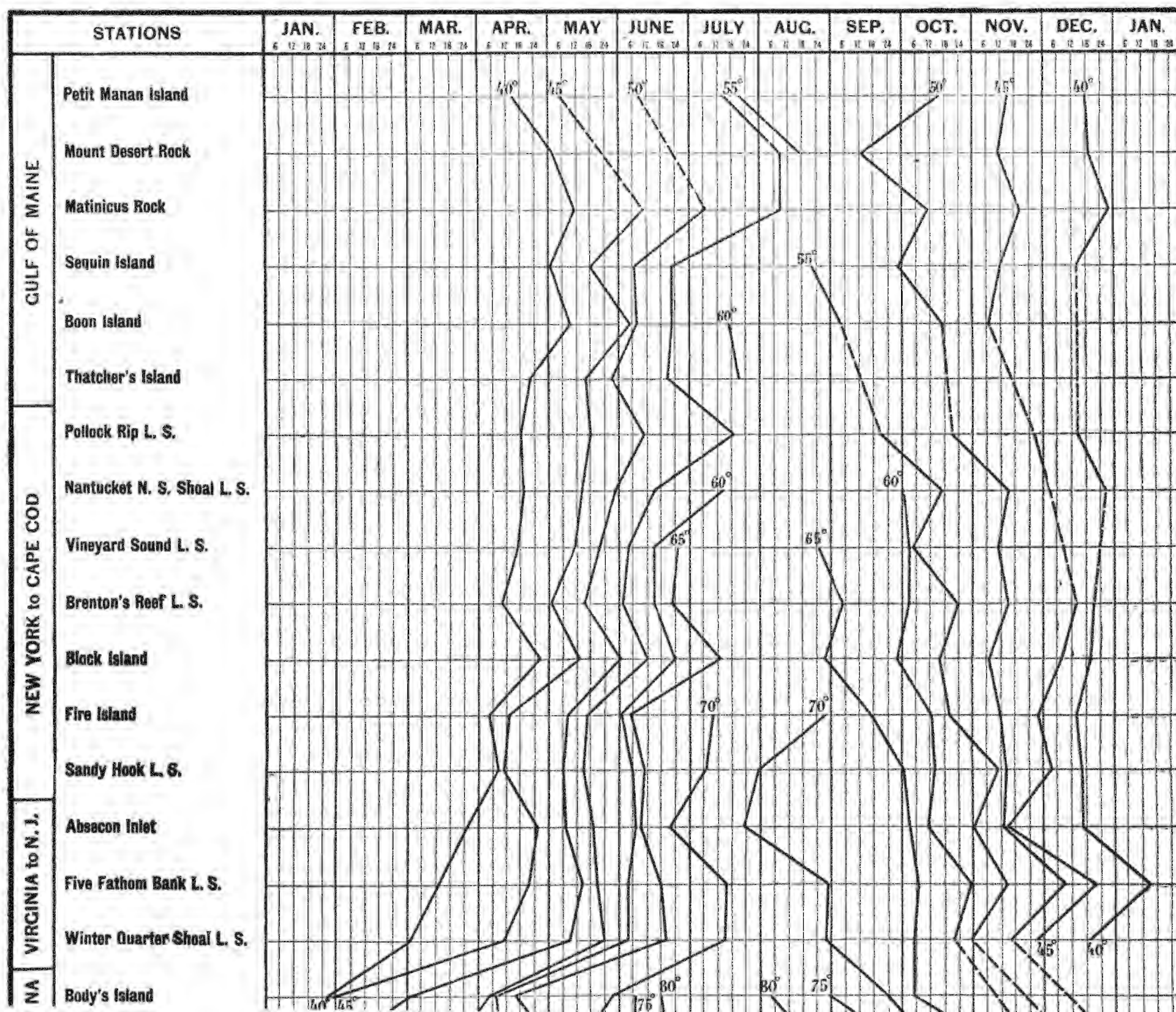
The two isotherms of 55° follow one another closely at Petit Manan and Mount Desert Rock; at Matinicus Rock the same temperature was recorded for two or three days, beginning August 9, and this point has been included in the first isotherm of 55°. At Boom Island the isotherm of 60° was reached July 17 (that temperature, however, continuing only until July 31), and at Thatcher's Island July 21, with no corresponding observations during the period of falling temperature; at Pollock Rip temperatures of 60° were occasionally recorded, but only for a day or two at a time. At Fowey Rocks the temperature was above 75° from February 3 to March 3, after which there was a period of lower temperature, continuing until April 1. At the Tortugas the temperatures of 75° and 80° were not continuous between the dates on which the isotherms of 75° and 80° are plotted.

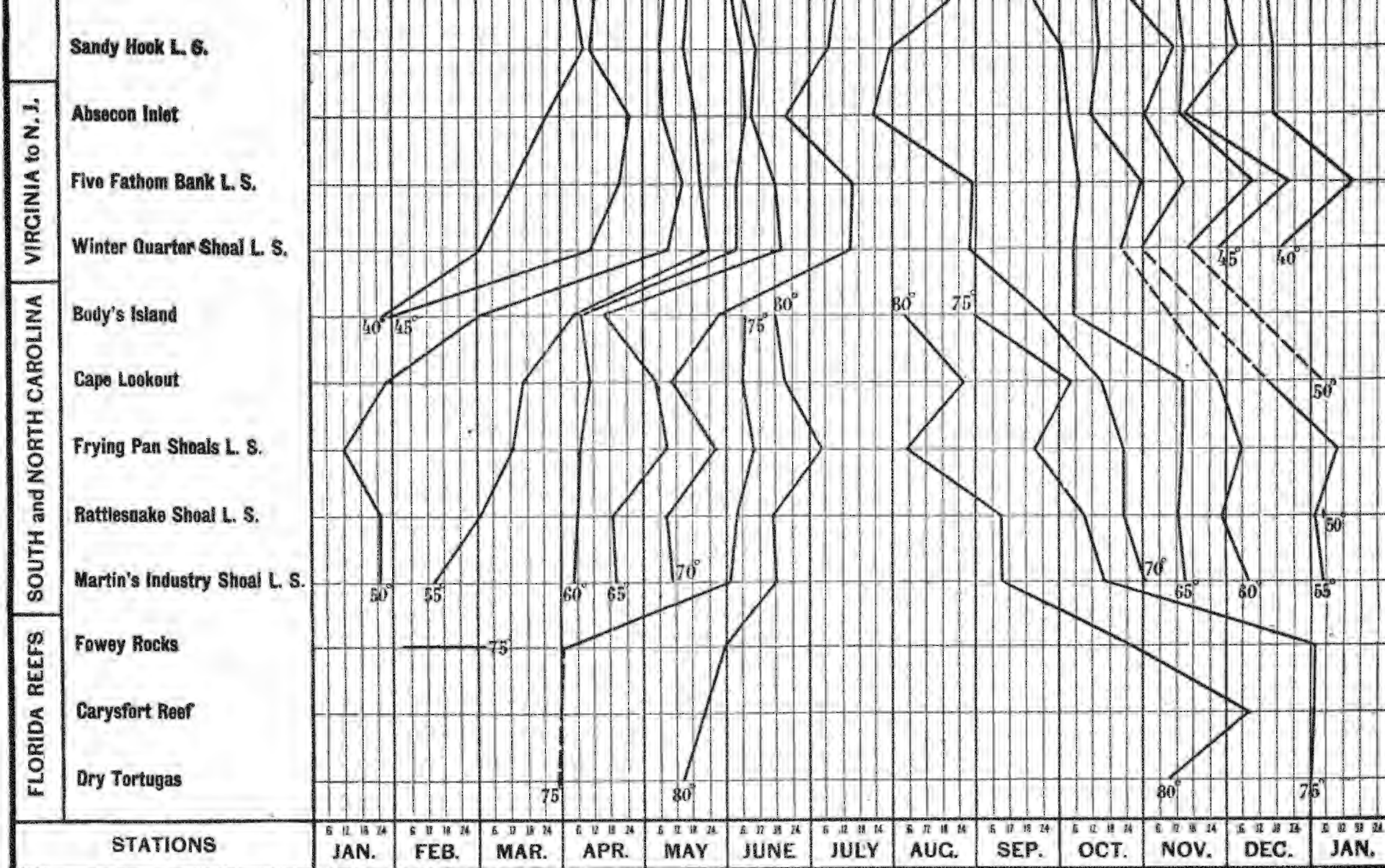
OCEAN TEMPERATURE CHART No. 28

By RICHARD RATHBUN.

Isothermal lines connecting the series of Light House Stations represented on Chart No. 1, constructed for every five degrees of temperature, Fahrenheit, from 40 degrees to 80 degrees, inclusive, for the year 1883.

(ISSUED IN 1886.)





This chart is divided vertically into thirteen months in order to include the first month of the following year. Each month is further divided, by the lighter lines, into periods of six days each, except in the case of those months having fewer or more days than 30, when the last division of the month may equal four, five, or seven days. The 1st, 6th, 11th, 18th, 24th and last days of the month fall on the vertical lines. The transverse lines represent the stations from which they extend. A complete break in the isothermal line opposite any station generally indicates that the temperature did not reach the isotherm at that station during the year. A line consisting of dashes denotes a lack of observations for the corresponding station.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 29.

Isothermal lines connecting the series of light-house stations on the eastern coast of the United States, represented on Chart No. 1, constructed for every 5° of temperature, Fahrenheit, from 40° to 80°, inclusive, for the year 1884.

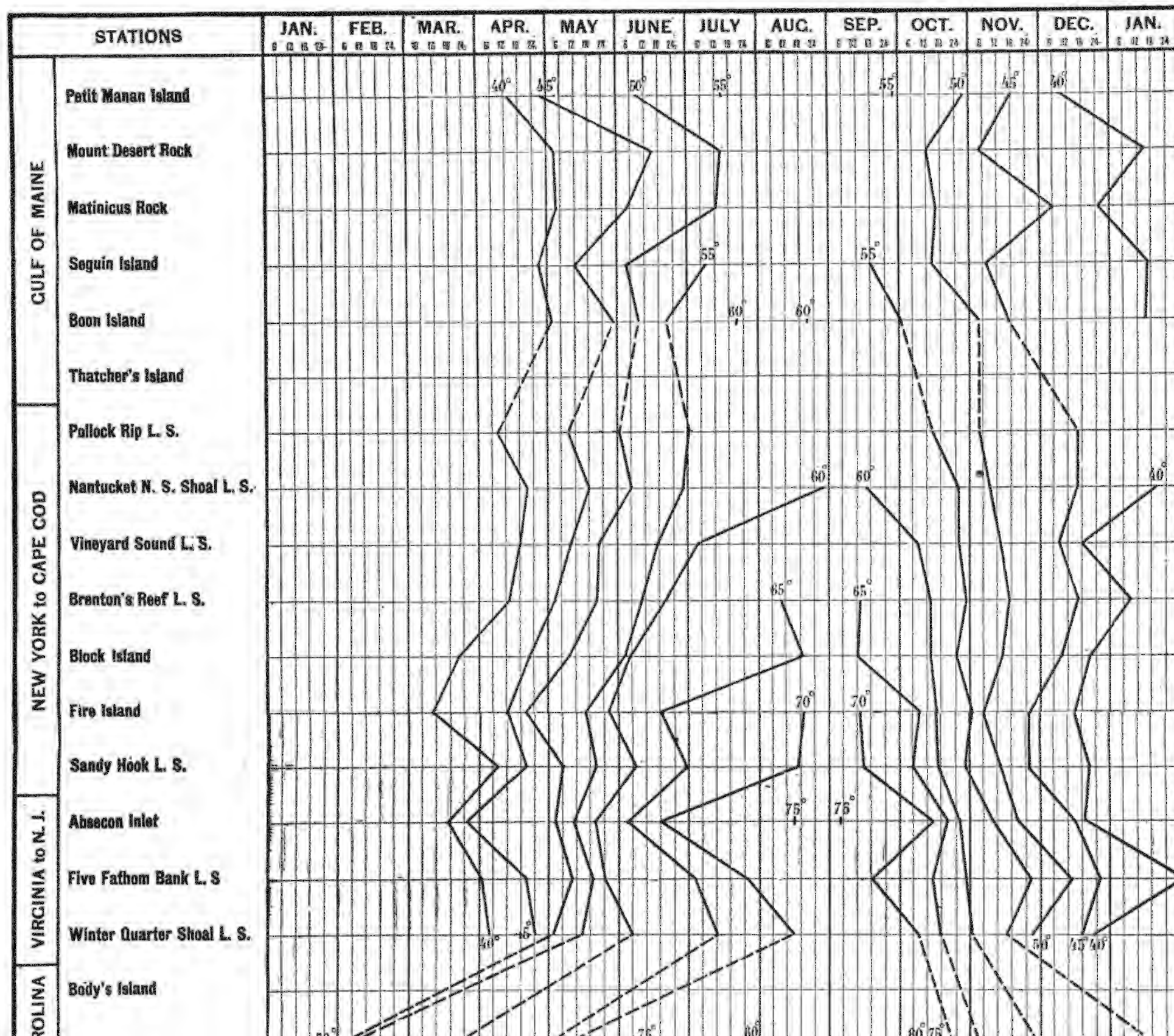
Higher temperatures than 55° were recorded at Petit Manan, but not at Mount Desert Rock and Matinicus Rock. The isotherm of 60° extends north continuously only to Nantucket New South Shoal, but the same temperature was recorded at Boon Island. Breaks of a similar character also occur in the isotherms of 75° and 80° at the southern stations. The temperature fell below 75° at the Tortugas several times during the year and reached 80° only between October 24 and 29.

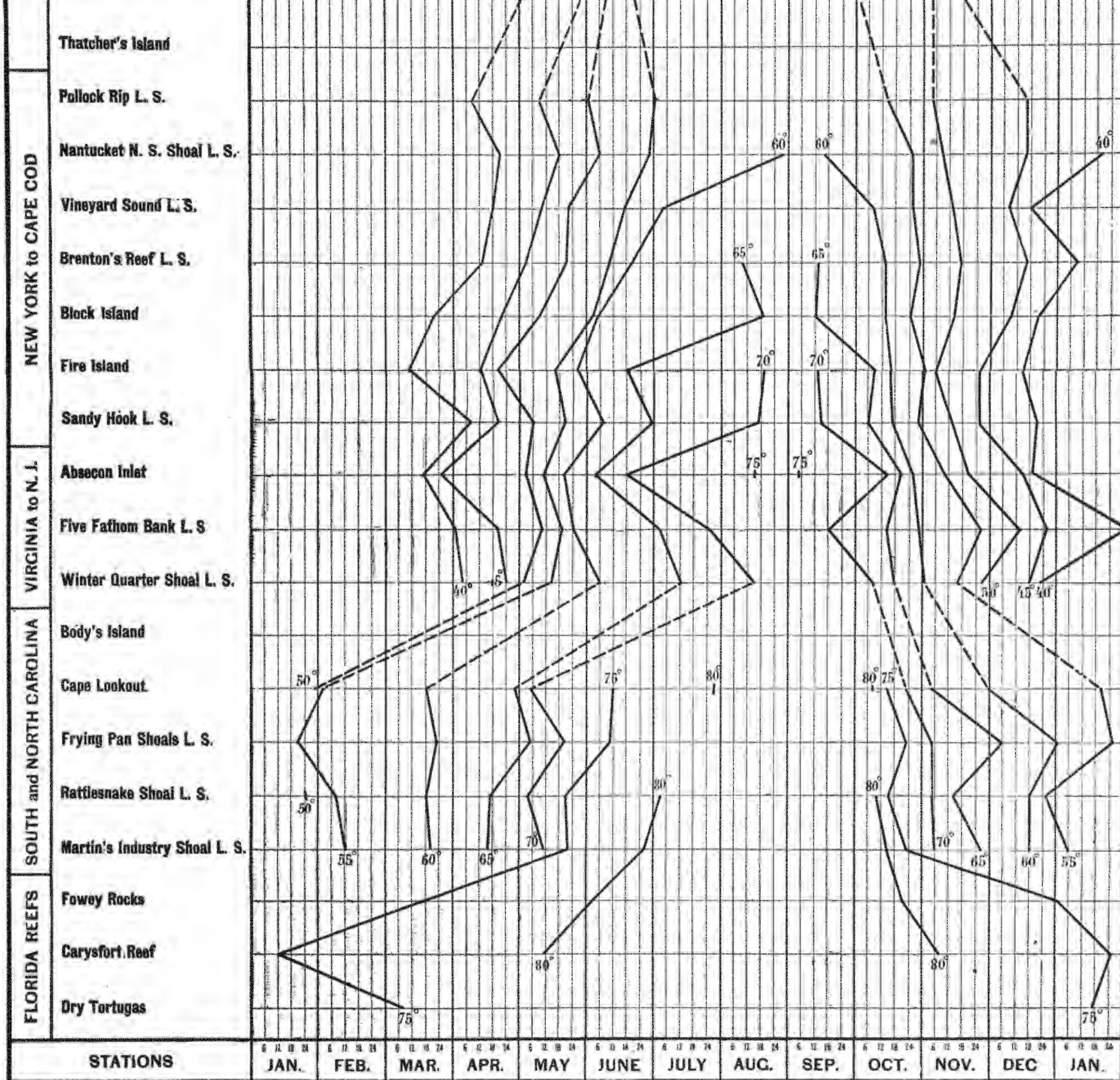
OCEAN TEMPERATURE CHART No. 29

By RICHARD RATHBUN.

Isothermal lines connecting the series of Light House Stations represented on Chart No. 1, constructed for every five degrees of temperature, Fahrenheit, from 40 degrees to 80 degrees, inclusive, for the year 1884.

(ISSUED IN 1886.)





This chart is divided vertically into thirteen months in order to include the first month of the following year. Each month is further divided, by the lighter lines, into periods of six days each, except in the case of those months having fewer or more days than 30, when the last division of the month may equal four, five, or seven days. The 1st, 6th, 12th, 18th, 24th and last days of the month fall on the vertical lines. The transverse lines represent the stations from which they extend. A complete break in the isothermal line opposite any station generally indicates that the temperature did not reach the isotherm at that station during the year. A line consisting of dashes denotes a lack of observations for the corresponding station.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 30.

Isothermal lines connecting the series of light-house stations on the eastern coast of the United States, represented on Chart No. 1, constructed for every 5° of temperature, Fahrenheit, from 40° to 80°, inclusive, for the year 1885.

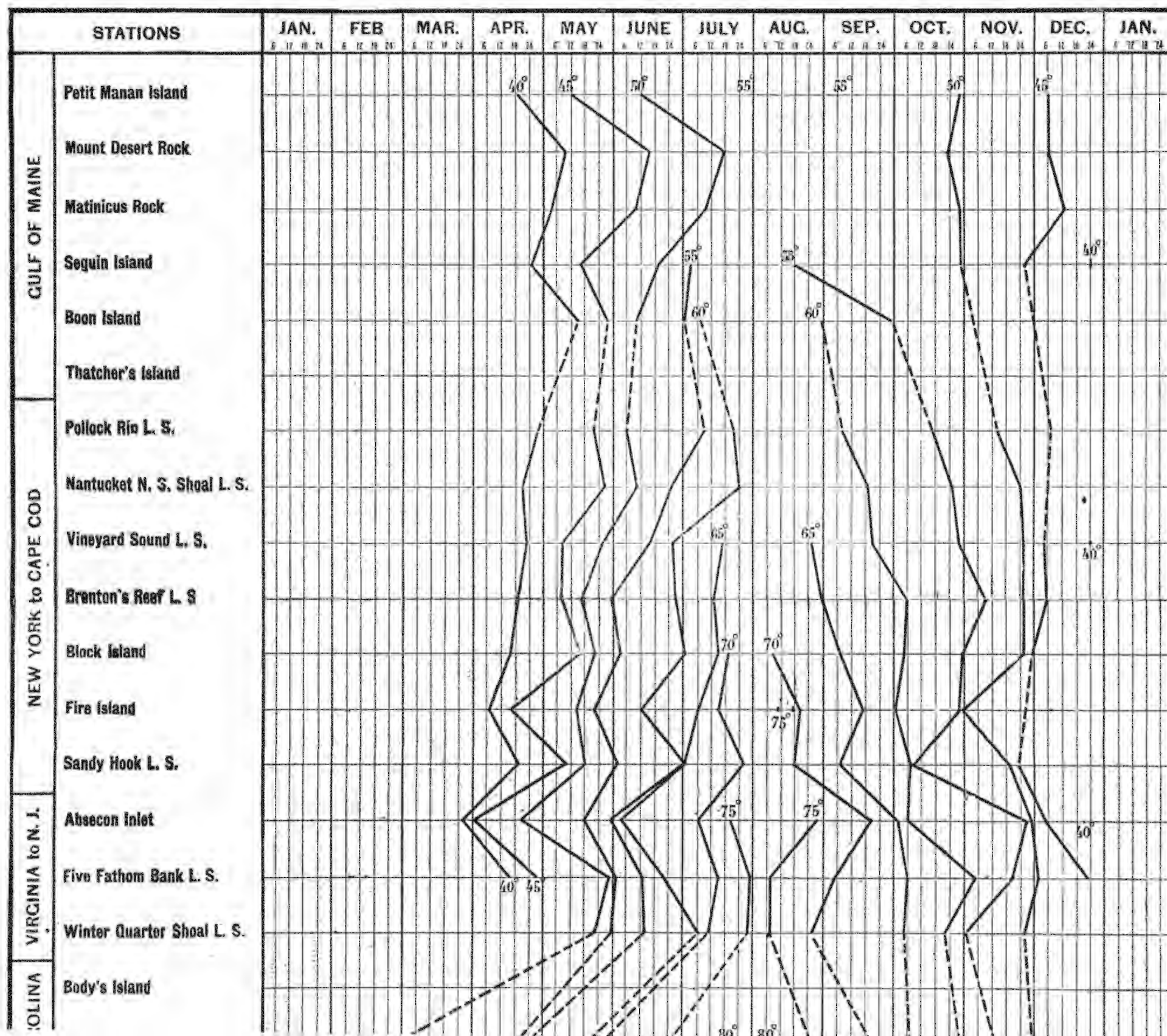
At the time this chart was prepared, the temperature records for 1886 were not available, and it was, therefore, impossible to plot the isotherm of 40° during the period of falling temperature, excepting for those stations at which that temperature was reached in December. As in most previous years, higher temperatures than 55° were recorded at Petit Manan, although the isotherms of 55° extended north continuously only as far as Seguin Island.

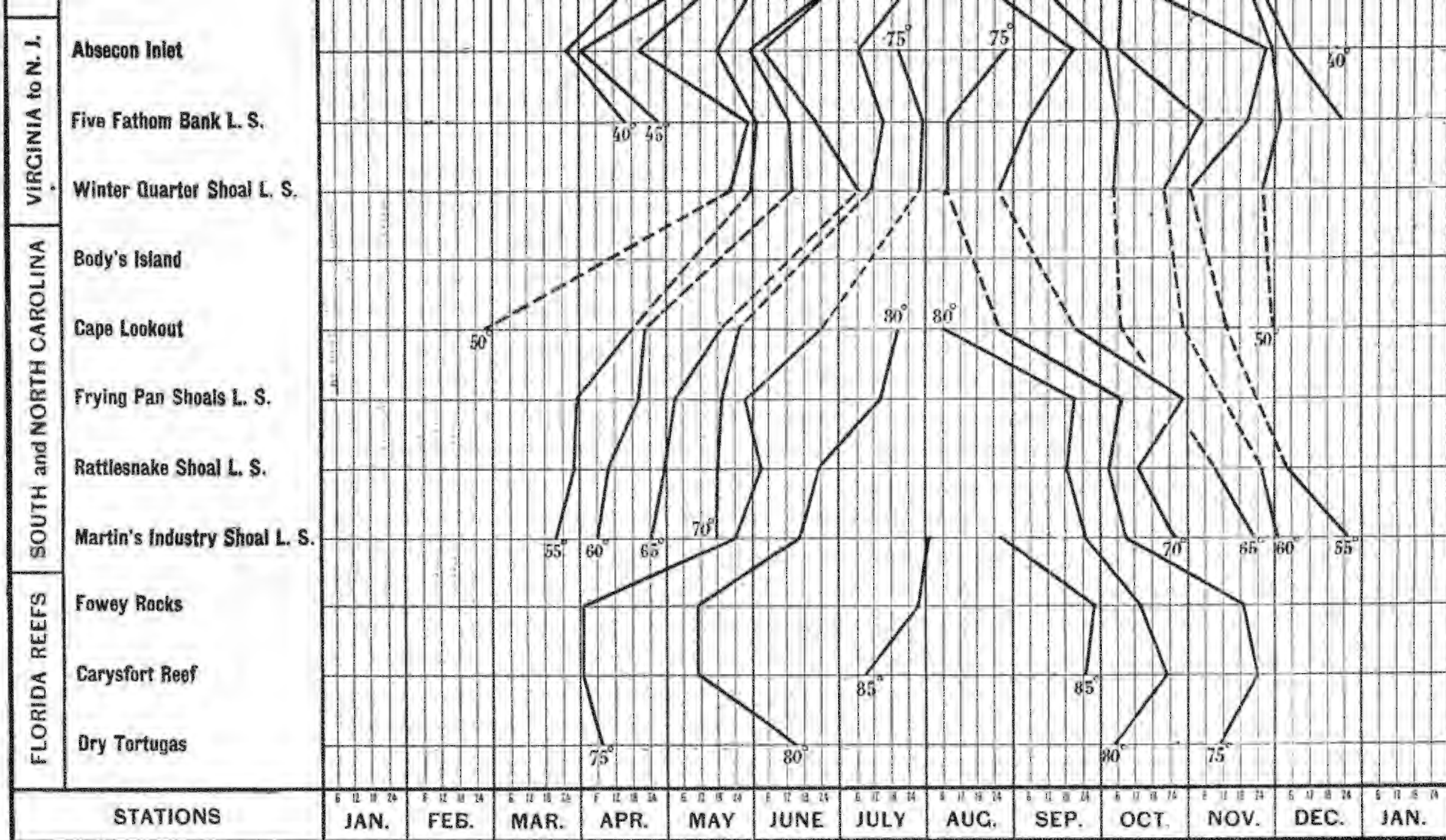
OCEAN TEMPERATURE CHART No. 30

By RICHARD RATHBUN.

Isothermal lines connecting the series of Light House Stations represented on Chart No. 1, constructed for every five degrees of temperature, Fahrenheit, from 40 degrees to 80 degrees, inclusive, for the year 1885.

(ISSUED IN 1886.)





This chart is divided vertically into thirteen months in order to include the first month of the following year. Each month is further divided, by the lighter lines, into periods of six days each, except in the case of those months having fewer or more days than 30, when the last division of the month may equal four, five, or seven days. The 1st, 6th, 12th, 18th, 24th and last days of the month fall on the vertical lines. The transverse lines represent the stations from which they extend. A complete break in the isothermal line opposite any station generally indicates that the temperature did not reach the isotherm at that station during the year. A line consisting of dashes denotes a lack of observations for the corresponding station.

EXPLANATION OF OCEAN TEMPERATURE CHART No. 31.

Isothermal lines connecting the series of light-house stations on the eastern coast of the United States, represented on Chart No. 1, constructed for every 5° of temperature, Fahrenheit, from 40° to 80° , inclusive, being the means of five years' observations, from 1881 to 1885, inclusive.

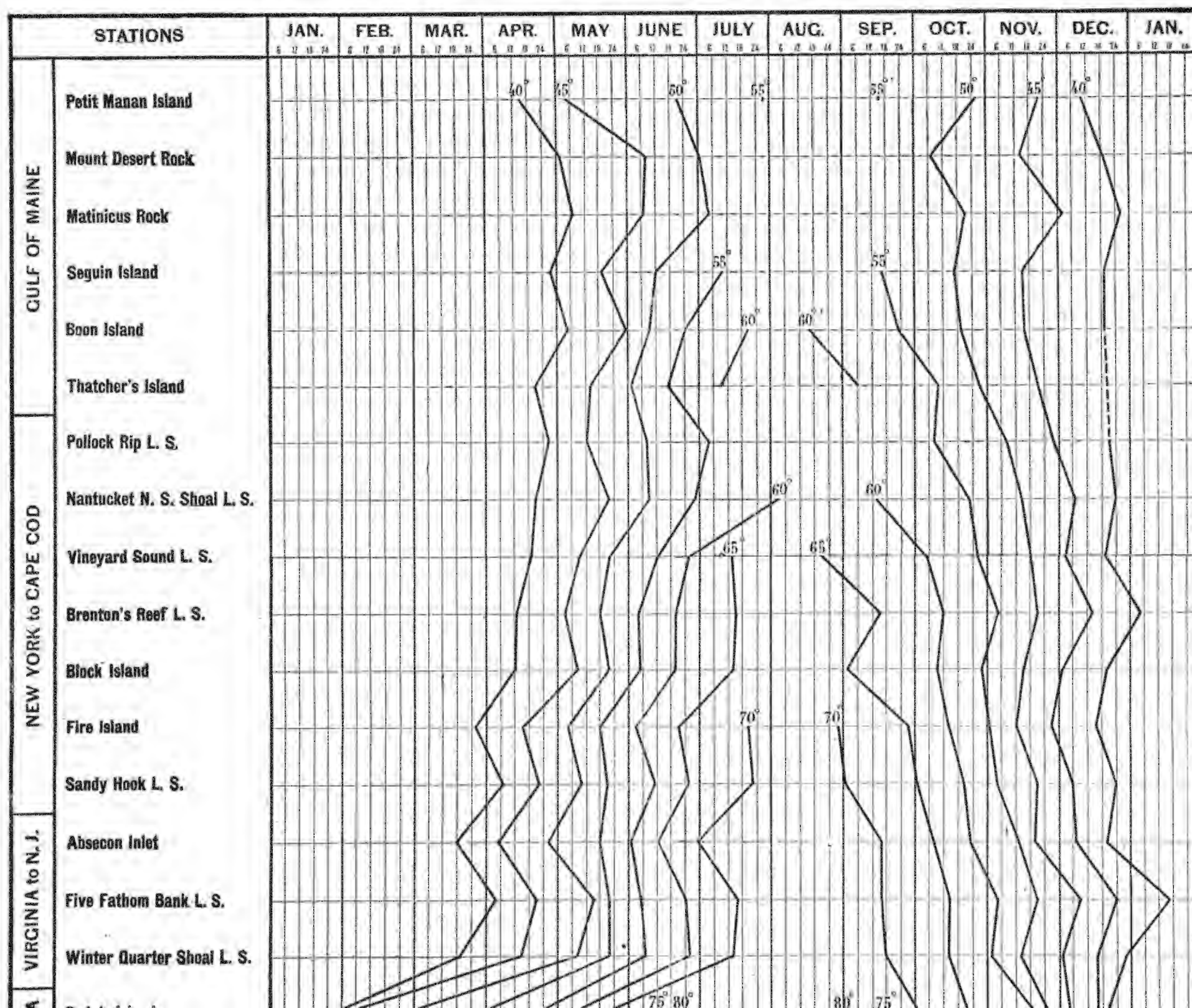
Most of the plottings on this chart are reductions of the observations of five years, but in some cases they represent a shorter period, though seldom less than four years, and never less than three years. The exact number of observations in each case, may be determined by reference to the five preceding charts (Nos. 26-30) on which the isotherms for each year are separately shown. At Thatcher's Island, Massachusetts, no records were kept after the summer of 1883, and at Body's Island, Virginia, observations ceased to be taken after October of the same year. At none of the other stations, however, do serious breaks in the records occur, and there are seldom more than one or two omissions at any station.

OCEAN TEMPERATURE CHART No. 31

By RICHARD RATHBUN.

Isothermal lines connecting the series of Light House Stations represented on Chart No. 1, constructed for every five degrees of temperature, Fahrenheit, from 40 degrees to 80 degrees, being the means of five years observations, from 1881 to 1885, inclusive.

(ISSUED IN 1886.)



EXPLANATION OF OCEAN TEMPERATURE CHART No. 32.

The air and surface isotherms of 40°, 45°, and 50°, Fahrenheit, at the light-house stations of the eastern coast of the United States, during the years 1881 and 1883.

This chart has been prepared to permit of a comparison of the surface with the air isotherms at the several light-houses and light-ships now under consideration. It has been noticed by previous observers that, in certain localities, the rise and fall in the surface temperatures maintain a nearly constant relation to the rise and fall in the air temperatures at the same place. For example, the surface temperatures of 40°, 45°, and 50° may follow the air temperatures of the same value at more or less regular intervals, and the length of these intervals may be sufficiently uniform to permit of a prediction of the surface temperature several days in advance, with approximate accuracy. Such predictions would be of great practical value in determining the time when schools of those fishes that regulate their migrations by the surface temperature of the water might be expected at certain fishing grounds. It is very probable, for example, that the spring migrations of mackerel and menhaden are regulated mainly, if not entirely, by changes of surface temperature.

The writer has made many plottings of the air and surface isotherms conjointly, without discovering a constant ratio at any of the stations. The two sets of isotherms shown on the accompanying chart are presented as illustrations of the variations that occur.

		1881							1883					
STATIONS		JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	JAN.	FEB.	MAR.	APR.	MAY	JUNE
GULF OF MAINE	Petit Manan Island				40° 45' 50°			50°				40° 45' 50°		
	Mount Desert Rock				40° 45' 50°			50°				40° 45' 50°		
	Matinicus Rock				40° 45' 50°			50°				40° 45' 50°		
	Sequin Island				40° 45' 50°			50°				40° 45' 50°		
	Boon Island				40° 45' 50°			50°				40° 45' 50°		
	Thatcher's Island				40° 45' 50°			50°				40° 45' 50°		
NEW YORK to CAPE COD	Pollock Rip L. S.				40° 45' 50°			50°				40° 45' 50°		
	Nantucket N. S. Shoal L. S.				40° 45' 50°			50°				40° 45' 50°		
	Vineyard Sound L. S.				40° 45' 50°			50°				40° 45' 50°		
	Brenton's Reef L. S.				40° 45' 50°			50°				40° 45' 50°		
	Block Island				40° 45' 50°			50°				40° 45' 50°		
	Fire Island				40° 45' 50°			50°				40° 45' 50°		
VIRGINIA to N. J.	Sandy Hook L. S.				40° 45' 50°			50°				40° 45' 50°		
	Absecon Inlet				40° 45' 50°			50°				40° 45' 50°		
	Five Fathom Bank L. S.				40° 45' 50°			50°				40° 45' 50°		
	Winter Quarter Shoal L. S.				40° 45' 50°			50°				40° 45' 50°		
SOUTH and NORTH CAROLINA	Body's Island				40° 45' 50°			50°				40° 45' 50°		
	Cape Lookout				40° 45' 50°			50°				40° 45' 50°		
	Frying Pan Shoals L. S.				40° 45' 50°			50°				40° 45' 50°		
	Rattlesnake Shoal L. S.				40° 45' 50°			50°				40° 45' 50°		
FLORIDA REEFS	Martin's Industry Shoal L. S.				40° 45' 50°			50°				40° 45' 50°		
	Fowey Rocks				40° 45' 50°			50°				40° 45' 50°		
	Carysfort Reef				40° 45' 50°			50°				40° 45' 50°		
	Dry Tortugas				40° 45' 50°			50°				40° 45' 50°		
STATIONS		JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	JAN.	FEB.	MAR.	APR.	MAY	JUNE

UNITED STATES COMMISSION OF FISH AND FISHERIES

SPENCER F. BAIRD, COMMISSIONER

THE FISHERIES
AND
FISHERY INDUSTRIES
OF THE
UNITED STATES

PREPARED THROUGH THE CO-OPERATION OF THE COMMISSIONER OF FISHERIES
AND THE SUPERINTENDENT OF THE TENTH CENSUS

BY

GEORGE BROWN GOODE

ASSISTANT SECRETARY OF THE SMITHSONIAN INSTITUTION
AND A STAFF OF ASSOCIATES

SECTION IV
THE FISHERMEN OF THE UNITED STATES

By GEORGE BROWN GOODE AND JOSEPH W. COLLINS

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THE FISHERMEN OF THE UNITED STATES.

A.—NATIONALITY AND GENERAL CHARACTERISTICS.

1. GENERAL REVIEW.

In 1880 there were 101,684 professional fishermen in the United States. In addition to the professional fishermen there is a large class of men who have been called "semi-professional fishermen," including the men who derive from the fisheries less than half of their entire income.

In the class of shoresmen may be placed (1) the curers and packers of fish; (2) the vessel owners and fitters who furnish supplies and apparatus for the use of the active fishermen; (3) the shopkeepers from whom they purchase provisions and clothing; (4) the skilled laborers who manufacture for them articles of apparel and shelter; (5) the manufacturers of boxes, barrels, refrigerators, and other appliances used in packing and preserving the catch; (6) the vessel and boat builders and artisans who keep the fleet in repair; and (7) the fish dealers and market men. Taking into account all those persons who are directly employed in the fisheries for a greater or less portion of the year, those who are dependent upon the fishermen in a commercial way for support, and the members of their families who depend on their labors, it cannot be extravagant to estimate the total number of persons dependent upon the fisheries of this country at from 800,000 to 1,000,000.

The total value of the fisheries of the United States to the producers in 1880 was \$14,546,053, and a fair estimate of the wholesale market value of the products would increase the amount to nearly \$90,000,000.

Of the twenty-nine States and Territories whose citizens are engaged in the fishery industry, sixteen have more than a thousand professional fishermen each. The most important of these is Massachusetts, with 17,105 men; second stands Maine, with 8,110; unless, indeed, the 16,000 oystermen of Virginia and the 15,000 of Maryland are allowed to swell the totals for those States. Maine, however, stands second so far as the ocean fisheries proper are concerned.

In geographical areas the Southern Atlantic States rank first in the number of fishermen, with 38,774 men; followed by the New England States, with 29,838; the Middle States, exclusive of the Great Lakes, with 12,584; the Pacific States and Territories, 11,613; the Great Lakes, 4,493; and the Gulf States, 4,382.

The number of professional fishermen in each State and Territory is as follows:

State or Territory.	Number.	State or Territory.	Number.	State or Territory.	Number.
Alabama.....	545	Maine.....	8,110	Ohio.....	925
Alaska.....	6,000	Maryland.....	15,873	Oregon.....	2,785
California.....	2,089	Massachusetts.....	17,105	Pennsylvania.....	511
Connecticut.....	2,585	Michigan.....	1,600	Rhode Island.....	1,602
Delaware.....	1,662	Minnesota.....	30	South Carolina.....	964
Florida.....	2,284	Mississippi.....	100	Texas.....	491
Georgia.....	809	New Hampshire.....	376	Virginia.....	16,051
Illinois.....	265	New Jersey.....	5,659	Washington Territory.....	729
Indiana.....	45	New York.....	5,630	Wisconsin.....	730
Louisiana.....	1,300	North Carolina.....	4,729	Total.....	101,684

The majority of our fishermen are native-born citizens of the United States, although in certain localities there are extensive communities of foreigners, clinging to the traditions of their fatherlands, and conspicuous in the regions where they dwell by reason of their peculiar customs and physiognomies. Most numerous of these are the natives of the British Provinces, of whom there are at least 4,000 employed in the fisheries of New England, Gloucester reporting 1,600, Provincetown 800, New Bedford 800, and smaller numbers in other minor ports of this region.

There are probably not less than 2,000 Portuguese, chiefly natives of the Azores and the Cape de Verde Islands. In the New Bedford whaling fleet there are about 800 of these men; at Provincetown 400, many of them on the whaling vessels; in Gloucester 250, and on the coast of California, 200. Most of the Portuguese have brought their families with them and have built up extensive communities in the towns whence they sail upon their fishing voyages.

There are also about 1,000 Scandinavians, 1,000 or more of Irish and English birth, a considerable number of French, Italian, Austrians, Minorcans, Slavs, Greeks, Spaniards, and Germans. In the whaling fleet may be found Lascars, Malays, and a larger number of Kanakas, or natives of the various South Sea Islands. In the whale fishery of Southern New England a considerable number of men of partial Indian descent may be found, and in the fisheries of the Great Lakes, especially those of Lake Superior and the vicinity of Mackinaw, Indians and Indian half-breeds are employed.

The salmon and other fisheries of Puget Sound are prosecuted chiefly by the aid of Indian fishermen. In Alaska, where the population depends almost entirely upon the fisheries for support, the head of every family is a professional fisherman. Though upon a very low estimate one-fourth of the inhabitants of Alaska should be considered as fishermen, few of them catch fish for the use of others than their own immediate dependents.

Only one Chinaman has as yet enrolled himself among the fishermen of the Atlantic coast, but in California and Oregon there are about 4,000 of these men, all of whom, excepting about 300, are employed as factory hands in the salmon canneries of the Sacramento and Columbia basins. The 300 who have the right to be classed among the actual fishermen live, for the most part, in California, and the product of their industry is, to a very great extent, exported to China, although they supply the local demands of their countrymen resident on the Pacific coast.

The negro element in the fishing population is somewhat extensive. We have no means of ascertaining how many of this race are included among the native-born Americans returned by the census reporters. The shad fisheries of the South are prosecuted chiefly by the use of negro muscle, and probably not less than 4,000 or 5,000 of these men are employed during the shad and herring season in setting and hauling the seines. The only locality where negroes participate to a large extent in the shore fisheries is Key West, Fla., where the natives of the Bahamas, both negro and white, are considered among the most skillful of the sponge and market fishermen. Negroes are rarely found, however, upon the sea-going fishing vessels of the North. There is not a single negro among the 5,000 fishermen of Gloucester, Mass., and their absence from the fishing vessels of other New England ports is none the less noteworthy. There is, however, a considerable sprinkling of negroes among the crews of the whaling vessels of Provincetown and New Bedford. New Bedford alone reports over two hundred negroes: these men are, for the most part, natives of Jamaica, St. Croix, and other of the West India islands, and also of the Cape de Verde Islands, where American whaling vessels engaging in the Atlantic fishery are accustomed to make harbor for recruiting and enrolling their crews.

As a counterpart to the solitary Chinaman engaged in the Atlantic fisheries, we hear of a solitary negro on the Pacific coast, a lone fisherman, who sits on the wharf at New Tacoma, Washington Territory, and fishes to supply the local market.

The number of foreign fishermen in the United States, excluding the 5,000 negroes and the 8,600 Indians and Eskimos, who are considered to be native-born citizens, probably does not exceed 10 to 12 per cent. of the total number.

As is shown by the figures given above, considerably more than one-half of the fishing population of the United States, excluding the oystermen of Virginia and Maryland, belongs to the Atlantic coast north of the Capes of Delaware. Of this number, at least four-fifths, or 40,000, are of English descent. They are by far the most interesting of our fishermen, since to their numbers belong the 20,000 or more men who may properly be designated the "sailor fishermen" of the United States, the crews of the trim and beautiful vessels of the sea-going fishing-fleet, which should be the chief pride of the American marine, and which is of such importance to our country as a training school for mariners, and as a medium through which one of the most valuable food resources of the continent is made available.

The fishing population of Maine, Massachusetts, and Connecticut is composed, for the most part, especially in the country districts, of native-born Americans. In the large fishing ports there is, however, an extensive admixture of foreigners, among whom the natives of the British Provinces, chiefly Nova Scotians and Newfoundlanders, are largely in the majority. The Beverly bankers are manned to a large extent by Nova Scotians, who are shipped at the beginning of the summer by the vessels which proceed for that purpose to the seaport towns of that Province. The Plymouth fleet, before 1861, was manned almost wholly by Americans, then for some years chiefly by Nova Scotians, now almost entirely by Americans. Part of the crews and several of the captains of the Bucksport fishing vessels are Provincials, and there is a limited number of these men, principally from New Brunswick, engaged in the shore and vessel fisheries of Eastport. In addition to these, there are many Provincial fishermen at different points along the coast of Maine.

Gloucester has 140 men of British birth, a large proportion of whom are Irish, while the Boston market fleet is manned principally by Irishmen.

Gloucester has nearly 400 Scandinavians among its fishermen and about 70 Frenchmen. The New Bedford whaling fleet, with its motley gathering of sailors from every port of the world, has individuals of nearly every race. In 1880 the crews of this fleet were composed as follows: 900 Americans; 800 Portuguese; 250 English and Irish; 200 British-Provincials; 200 Germans; 200 South Sea Islanders or Kanakas; 200 Negroes; 50 French, and 50 Swedes.

In general traits of character fishermen cannot be distinguished from the population on shore. In some special branches of the fisheries, as the boat fisheries of Maine, the men live a comparatively secluded life, and acquire, after many years, a bearing and physiognomy peculiar to themselves.

The enterprise of New England fishermen is well known. They are not conservative, but eager to adopt inventions and discoveries that may promise to benefit them in their work. This trait is manifest in the readiness with which they have adopted the purse-seines in place of the hook and line in the capture of mackerel; and, again, in their readiness to experiment with and then to adopt gill-nets in the shore fisheries for the capture of cod.

They are a hardy and daring race of men, particularly in New England. Their powers of endurance and their skill are noteworthy. The highest type of seamanship is attained among American fishermen. The whalers of Nantucket and New Bedford have pursued their prey in all oceans, and have added greatly to the geographical knowledge of the world.

In general education the inhabitants of the fishing towns of New England are among the most

intelligent. The Plymouth colonists, soon after their arrival, set apart by law a portion of the revenue arising from the sale of fishing licenses for the support of public schools.

The schools of New England fishing towns are attended by the boys until they are old enough to go to sea, and by the girls until they are of a marriageable age. It is quite usual for boys to engage in fishing in summer and go to school in the winter; some do this until they have arrived at the age of manhood. The girls are generally better educated than the boys, and the intelligence and refinement of the women of the fishing towns seem to a stranger quite noteworthy. The excellent education of wives and mothers of the fishermen cannot be without important effects upon the intelligence of the class.

The people of most of the fishing villages, from the Bay of Fundy to New York, are generally as intelligent and refined as in the average agricultural and manufacturing communities of the adjoining interior.

The fishermen of the Southern States are not remarkable for their intelligence; in fact, the thousands of oyster dredgers of the Chesapeake Bay are by reputation a degraded class. Their very lawlessness is supposed to recommend them to the service. The oyster-tongers in the same region are of a higher class, yet indolent and improvident. By law of the State of Maryland the revenue from the sale of oyster-tonging licenses, amounting annually to about \$20,000, is given to the public school commissioners, who apply it to the support of schools, license-money from colored oystermen being for the support of colored schools, and from white oystermen for white schools.

TRAITS AND CUSTOMS OF NEW ENGLAND FISHERMEN.—The system of discipline upon a New England fishing schooner is such that it requires extraordinary tact and judgment on the part of the commanding officer. The captain or skipper is the sole officer, and, except when he has some order to give in relation to sailing the vessel or catching fish, he has no special authority over the crew, and the respect with which he is treated by the men is only that which his personal character obtains for him. This system of officering the vessels is attended by many serious disadvantages, and it would be a great benefit to our fisheries if the crews could be organized more in accordance with the usage of the merchant marine.

The peculiar dialect of the fishermen affords opportunity for studies of great interest. Of course their language is not free from a considerable amount of slang and technical phrases peculiar to their profession. Many of their words were brought to this country by their ancestors two hundred years ago, and, although at that time common throughout England, have now become obsolete or are regarded as provincialisms. On many parts of the coast a very pure idiomatic English is spoken. The peculiar words which one constantly hears add force and interest to their conversations.

Although the sailor fishermen of New England are not as a class religious, in most of the smaller fishing towns a high tone of morality prevails. Profane language is almost universally prevalent, but in other respects moralists would in general find little to criticise. In very many places the skipper of a vessel loses caste if it is known that he allows his crew to fish on Sunday, and for two consecutive years the Menhaden Oil and Guano Association have passed resolutions forbidding their employes to fish upon the Sabbath. In the early part of the present century a barrel of rum was an indispensable article in the outfit of a fishing vessel; at present it is extremely rare for ardent spirits of any kind to be found on board of the vessels, and popular sentiment is greatly against its use. Most of the fishing ports along the coast have prohibitory laws, which are rigidly enforced.

Bearing in mind the difficulties met by fishermen in obtaining supplies of reading matter, the quantity and quality of their literature is somewhat remarkable. Hundreds of copies of such

papers as the New York Weekly, Saturday Night, Fireside Companion, New York Ledger, Harper's Weekly, and Frank Leslie's Illustrated Newspaper are bought weekly by the fishermen of Gloucester. On their vessels a number of volumes may always be found; Dickens, Shakespeare, Byron, and Abbott's Life of Napoleon being among the most popular works.

The food of the New England fishermen is usually of an excellent quality, and to this improvement during the past quarter of a century may be attributed the increase in the longevity and period of active service among these men; this is so noteworthy as to attract the attention of all observers. The cook is often better paid than the captain, and is, in fact, the most important member of the crew.

Diseases are comparatively rare, the most prevalent being dyspepsia and rheumatism. In the larger ports, where there is much competition, cases of nervous exhaustion are by no means infrequent among the skippers and the most ambitious fishermen. Vessels carry a plentiful supply of medicines, and some of the skippers are quite expert in the application of certain simple remedies.

Ports which, like Gloucester, engage in the winter fisheries, have their fishing population decimated every year or two by severe disasters, but the fishermen do not feel any hesitation in going to sea, never admitting that the disasters which have befallen their comrades can affect themselves.

To describe the routine of life on board of a fishing vessel would be interesting, since it is very unlike that of other men, even mariners of other classes. Three months or more spent on a vessel anchored in its solitary berth on the banks, hundreds of miles from the land, is an experience which necessarily develops many peculiar habits among those who follow such a life. From daybreak until dark they ply their lines from the deck or from little boats, and half of the night is often devoted to preserving the fish which have been caught during the day. Storms are constantly occurring, and the dangers to which these men are exposed are numerous and severe.

A system of mutual insurance, or rather provision for the welfare of their families, is practiced by the fishermen of Gloucester by which a certain percentage of each man's earnings is set aside, to be applied for the benefit of the wives and children of those who have been lost at sea. The financial profits of the fishermen are extremely uncertain. A common fisherman may make \$1,000 a year or may find himself at the end of twelve months deeply in debt for the supplies which have been advanced to his family by the shopkeepers during his absence. In 1859 the average yield to the fishermen of Marblehead was \$50 each, and in other years the profits have been even less. In some rare instances Gloucester skippers, who were owners of vessels, have made \$10,000 to \$15,000 a year.

One of the most interesting topics developed by the study of fishermen is that of their superstitions. The most common of these is that relating to "Jonahs." Certain articles of apparel, such as a black traveling-bag or a pair of blue mittens or stockings are thought to be sure to bring ill luck. Some fishermen think it "a Jonah" to leave a bucket half full of water on deck, to drive a nail on Sunday, to keep the deck clean, or to break a looking-glass. Superstitious usages are very little prevalent; the practice of wearing ear-rings, so common among other mariners and believed to be beneficial to the sight, is rarely met with.

Certain curious customs might be referred to, but these are usually carried out in a joking manner. The fisherman who nails a horseshoe on the end of his bowsprit has usually no more faith in its supernatural power than the young lady who hangs it over the door of her parlor.

2. THE SHORE FISHERMEN OF MAINE.

GENERAL CHARACTERISTICS.—The men who are engaged in the shore fisheries of Maine are almost wholly of American birth. The majority of them have been brought up from their boyhood to a life on the water. Because of the decline of the coasting business in which their fathers, to a great extent, were employed before them, many of them have engaged in this particular branch of the fisheries as the only opportunity left them of making a living from the products of the sea.

HARDIHOOD.—Judging from the exposure to which these fishermen are frequently subjected, and the absence of ill effects upon their health by reason of such exposures, it may safely be said that they are a hardy class of men; perhaps not as daring and vigorous, however, as are the men engaged in deep-sea fishing and who are often absent from shore for weeks and months together. The shore fishermen are frequently compelled to spend the night in their little open boats waiting for the turn of the tide or for a favorable wind.

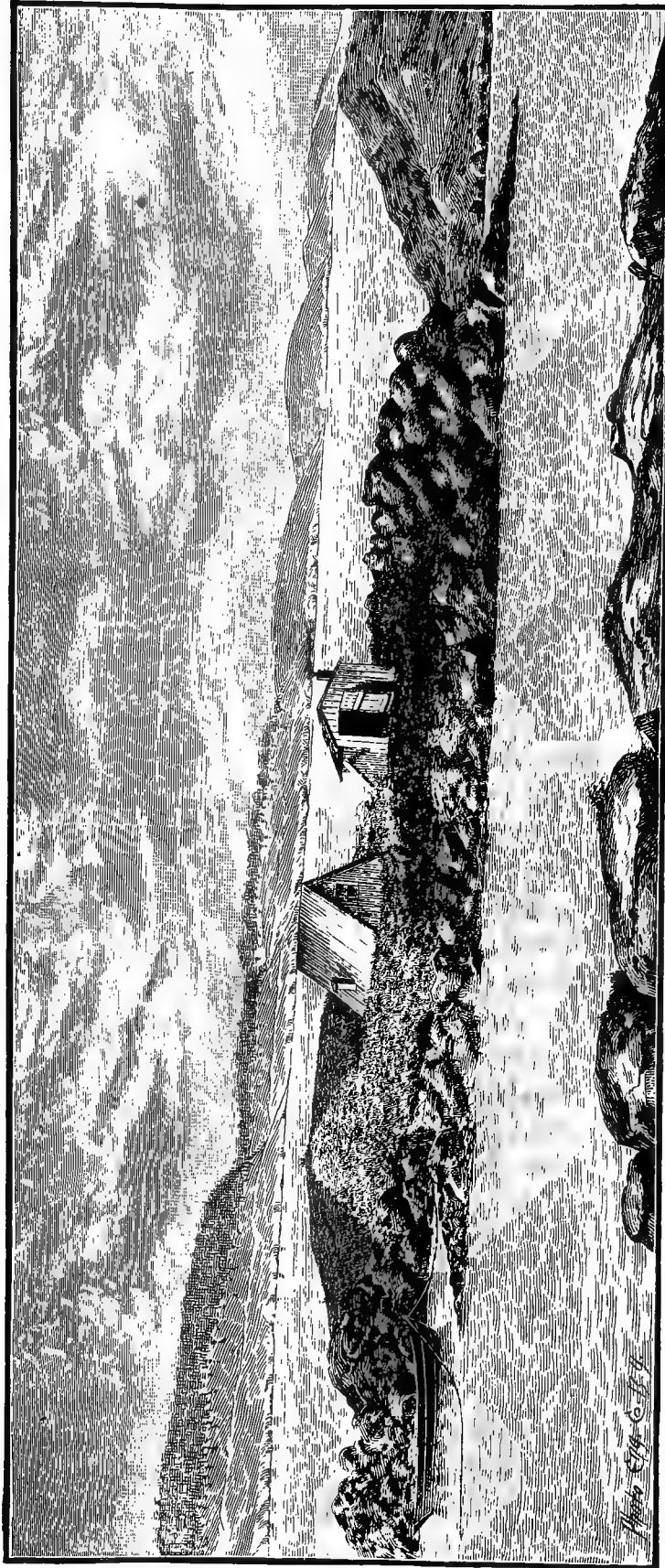
SUBMISSION TO DIFFICULTIES.—These fishermen are chronic grumblers, and not altogether without reason. The terrible scarcity of bait, particularly annoying when good fishing is reported by the more fortunate—combined with the miserable prices they sometimes obtain for their fish, is not calculated to make a man jubilant or arouse dormant energies, if such exist. Each is largely dependent upon his “buyer,” who, according to the state of the market, or for other reasons, may direct the fishermen either to go fishing next morning or stay at home. If he goes contrary to the advice of his patron he has a very poor chance of receiving from him any sum for his fish which will compensate the loss of time and labor. The wish to accumulate means is therefore absent by reason of its impossibility, and the time devoted to fishing is only so much as will provide himself and family with something to eat and wear. Some of these fishermen, however, are enterprising and industrious, and profiting by the inactivity of their fellows they acquire a fair competence.

It can hardly be said that the “chronic grumbler” is lazy, for when searching for bait or traveling to or from the grounds he will row a large boat several miles and think nothing of it. This apparent contradiction in his nature is due to his inability to change the existing state of affairs or to earn a livelihood in any other way; thus hardship and privations are calmly submitted to as a matter of course.

LACK OF ENTERPRISE.—Money seems to have but small powers of attraction when offered to these fishermen for work not connected with fishing. A member of our staff, who visited the coast in 1880, found considerable trouble in securing the services of some one who was willing to row him from place to place, and thereby earn good wages, though many of them were doing nothing. A larger return than common from selling fish is usually spent as fancy may first dictate or serves as a reason for deferring, as long as possible, the next fishing expedition.

MARRIAGE AND HOME LIFE.—Most of these men marry at an early age, generally from eighteen to twenty years: they thus become responsible for the support of a family almost before arriving at manhood.

The houses occupied by the families of these Maine shore-fishermen are usually old-fashioned wooden buildings, one and a half stories high; in some cases neat and home-like in appearance, but more generally lacking in taste and order. Most of these houses are surrounded by a “patch” of ground from three-quarters of an acre to three or four acres in area, which, if properly attended to on the days unpropitious for fishing, might provide largely toward the support of the family, but negligence characterizes the appearance of many and weeds flourish undisturbed. The families subsist, for the most part, upon the products of the sea—fish, lobsters, and clams—and upon the vegetables from their gardens.



Camp of shore fishermen near Cape Newagen, Maine.

Drawing by Capt. J. W. Collins.

When at home the fisherman of this class passes most of his time in lounging about with his companions, relating personal adventures and talking superficially over the outlook. Not possessing a "business head," he does not carry these speculations further than to "hope for better luck." The same time spent in hunting for bait, scarce as it is, might better serve to realize his hopes. He may, despite his failings, be considered as honest, good-hearted, and contented with his lot, or perhaps we may better express it, resigned to fate.

EDUCATION.—Education is not in an advanced state. There are schools in almost all of the fishing towns, where winter and summer sessions are held, attended by the young of both sexes. The boys are taken away permanently from school as soon as they are considered useful, leaving the inference a fair one that the girls are better educated when they leave school than the boys. The means of supplying food for the boys' minds being so limited it is not strange that their heads are undisturbed by constant planning of great schemes having for their end the accumulation of wealth.

FINANCIAL CONDITION.—The fishermen of the present time have lost the privilege of obtaining on credit articles of food, &c., from the storekeepers, who, on account of the tendency on the part of the former to avoid the payment of their bills, have in the past lost heavily. Formerly the fishermen were good customers, buying extensively and making exertions to fulfill their obligations.

A fair average return per annum to the fisherman, since 1875, when bait began to be scarce and the price of fish to diminish, is estimated at \$175; in 1879, however, the majority did not realize \$100 apiece.

FISHERMEN AT GEORGETOWN.—The shore-fishermen of the Kennebec side of Georgetown are mostly engaged in pound fishing, but a few are interested in boat fishing for cod, haddock, hake, and pollock. They are almost wholly dependent for their support upon the money obtained by the sale of their fish. In summer, however, a few weeks are spent in picking and shipping berries, and in digging clams or cutting ice in winter. They do not engage in any one particular kind of fishing, but turn their attention to that which they believe to be the most profitable at the time. Some of these men always return at night; others, known as "campers," start in the spring with a small stove, blankets, and some cooking utensils, staying away until some necessity compels them to leave for home. The returns earned in this way used to equal the average returns of the deep-sea fishermen, but for the past three or four years the case has been very different.

BOAT-FISHERMEN OF PORTLAND.—The boat-fishermen of Portland live, for the most part, on the islands in the vicinity of the city and at Cape Elizabeth, both for economy and for convenience in getting to and from the fishing grounds. This class represents the better element, being very largely composed of married men, who prefer to undergo lonesome hardship in their little boats remaining near home to being separated from those dear to them in large vessels for a long time. It is estimated that the married boat-fishermen of Portland number one hundred and ten, and that they possess an average of about three children each.

3. THE VESSEL-FISHERMEN OF MAINE.

GENERAL CHARACTERISTICS.—The fishing vessels of Maine are largely manned by men of American birth, most of them natives of this State, who have followed the fisheries from their youth. Their habits of life are in many respects the same as those of the shore-fishermen. They have, as a class, all the enterprise and daring of the fishermen at the larger ports in Massachusetts. They are, however, more conservative and contented, and do not care to risk the great dangers attending the winter fisheries on the Banks, preferring rather to follow the fisheries during the summer months, and to remain idle or engage in other pursuits during the winter. Many of them, however, follow the shore fisheries in winter and the vessel fisheries in summer.

The reason why the Maine fishermen do not engage in the offshore winter fisheries can probably be found in the fact that they have not the system of mutual insurance which prevails in Gloucester. The probability of vessels being lost on winter trips is so great that few individuals or firms care to incur the risk without insurance; and the cost of insuring in stock companies is too high to leave any profits. It is, therefore, seemingly a question of the profitable employment of capital, and not a lack of courage or enterprise in the fishermen, that has commonly prevented the winter fisheries from being extensively prosecuted from Maine.

In substantiation of this statement, it can be said that a large percentage of the most daring and efficient fishermen sailing from Gloucester are natives of Maine. In the sharp competition which exists among the fishermen of this port, those from Maine hold a prominent place and are second to none in bravery, hardihood, and seamanship—qualities which are pre-eminently required in the winter fisheries.

The following notes, communicated to Mr. Earll by a close observer, for many years living in one of the principal fishing ports of Maine, indicate the habits and traits of those fishermen at some of the fishing ports of this State:

“**EARLY TRAINING.**—A man about to ship in a vessel will make arrangements to take his boy with him. The boy is taken out at the age of ten to twelve years. At first he may be kept aboard the vessel cutting sounds and fishing over the rail, or he may be allowed to accompany his father in his dory; and then he adds to the father's catch. He returns in the fall and again enters school for the winter term, but is taken out again early in spring to go on another trip. By the time he is fifteen, or sixteen at most, he has a dory of his own and forms one of the crew, catching his share of the trip. With his boyish desire to be a man he readily takes to any vice common to others of the crew, and is soon led to be as rough as any of his companions. His chief aim now is to be a fisherman and to be with the fishermen, and he returns in the fall feeling that he is too old for school, and if he enters it is largely that he may have a good time. He now wishes to study only geography and arithmetic, thinks reading and spelling beneath him, while, to use his own language, ‘grammar will do well enough for the biled-shirt fellers and the girls, but as for him he has no time for such trash.’ The only way now to reach him is by a general black-board exercise and course of oral instruction in those branches against which he is prejudiced. This is being introduced with favorable results, but the average fisher-boy takes so little interest in schools after he has been away for two or three summers that he will improve but little. The fisherman's daughter fares better, for there is little to keep her busy outside of school, and she, if once interested in the work, has the chance of gratifying her desires beyond that of any other class. As a result we find her often a very bright and intellectual young girl where the school privileges will allow and where she is not kept back by the home influences.

“**MARRIED LIFE.**—When the fisherman marries he soon has a large family, varying with the locality, the inferior communities averaging more than the more intellectual and well-to-do ones. In one section of twenty families, taken in order as they chanced to live, the average was exactly 5, the extremes being 11 and 0. The hard times seem to have no influence upon either the marriage or birth rate, for in 1878, the culmination of a series of adverse years, there were more marriages than for any year since 1874 by considerable, and the birth rate was unusually large.*

* **HERRINGS AND MARRIAGES.**—“The connection between herrings and marriages may not be obvious to all, but the Scotch registers make it clear enough. In the returns for the third quarter of the present year (1871) the registrar of Fraserburgh states that the herring fishery was very successful, and the value of the catch, including casks and curing, may be set down at £130,000 sterling, and the marriages were 80 per cent. above the average. One registrar, in his return for the quarter, reports marriages in his district ‘like angels’ visits, few and far between.’ At the fishing villages it may be put more briefly—no herring, no wedding.”

“**LITERARY TASTES; ASSOCIATIONS.**—The fisherman reads but little, in fact almost nothing in the way of books, and confines himself almost wholly to story papers, though no one paper seems to have a preference.

“The seaman, be he fisherman or not, has, from long and constant association with his fellows, grown to be a man who is discontented in solitude. He has been so long and constantly in the company of others that he cannot endure being alone; and just here we find a partial explanation of his discontent with the ordinary shore life. When at home in winter he is not satisfied to remain by himself; he must have other men around him, and we see him congregating with others at an old wharf where they may while away the time in jesting together and in conversation about things pertaining to their vocation. If one is going to the village half a mile away he will wait an hour for the sake of having some one to walk down with, and, conversing only on subjects connected with his work, he gradually comes to enjoy himself only in the society of fishermen. Who has not overheard a conversation between two old salts and observed how easily it drifted into things connected with the sea and how persistently it clung there?

“**HOME LIFE.**—The man being away so much his wife learns to act as his agent, and generally being the more capable of the two she controls matters at home, and he comes often in the capacity of a boarder. Her word is considered better than his, and she is not infrequently the leader. He neglects work about the house at the proper time and cuts his wood in the snow, &c. During the hard times he has mortgaged his house, and often two families live together with little or nothing attractive about them.”

4. THE FISHERMEN OF THE ISLES OF SHOALS.

THE ISLES OF SHOALS FISHERMEN IN 1873.—Concerning the fishermen of these islands off the coast of New Hampshire, Celia Thaxter, in 1873, wrote:

“They lead a life of the greatest hardship and exposure, during the winter especially, setting their trawls 15 or 20 miles to the eastward of the islands, drawing them next day if the stormy winds and waves will permit, and taking the fish to Portsmouth to sell. It is desperately hard work, trawling at this season, with the bitter wind blowing in their teeth and the flying spray freezing upon everything it touches—boats, masts, sails, decks, clothes completely cased in ice, and fish frozen solid as soon as taken from the water. The inborn politeness of these fishermen to stranger women is something delightful to witness. I remember once landing in Portsmouth and being obliged to cross three or four schooners just in (with their freight of frozen fish lying open-mouthed in a solid mass on deck) to reach the wharf. No courtly gentlemen could have displayed more beautiful behavior than did these rough fellows, all pressing forward with real grace—because the feeling which prompted them was a true and lofty feeling—to help me over the tangle of ropes and sails and anchors to a safe footing on shore.

“Very few accidents happen, however: the islanders are a cautious people. Years ago, when the white sails of their little fleet of whale-boats used to flutter out of the sheltered bight and stand out to the fishing grounds in the bay, how many eyes followed them in the early light and watched them in the distance through the day, till, toward sunset, they spread their wings to fly back with the evening wind! How pathetic the gathering of women on the headlands when out of the sky swept the squall that sent the small boats staggering before it and blinded the eyes, already drowned in tears, with sudden rain that hid sky and sea and boats from their eager gaze! What wringing of hands, what despairing cries, which the wild wind bore away while it caught and fluttered the homely draperies and unfastened the locks of maid and mother to blow them about their pale faces and anxious eyes! Now no longer the little fleet goes forth, for the greater part of the

islanders have stout schooners, and go trawling with profit, if not with pleasure. A few solitaires fish in small dories, and earn a slender livelihood thereby.

"Most of the men are more or less round-shouldered, and seldom row upright, with head erect and shoulders thrown back. They stoop so much over the fish-tables—cleaning, splitting, salting, packing—that they acquire a permanent habit of stooping."*

5. THE INDIAN FISHERMEN OF NEW ENGLAND.

THE INDIANS OF PASSAMAQUODDY BAY.—The Passamaquoddy Indians in the neighborhood of Eastport, Me., are engaged in various fisheries, the chief object of pursuit being the porpoise, which is taken for its oil. The pursuit is an exciting one, the Indians in their slender birch-bark canoes approaching to within gun-shot, when the animal is killed, and afterward secured with a lance, and either towed to land or taken into the boat.

INDIANS OF SOUTHERN NEW ENGLAND.—The Indians of Gay Head, a well-known settlement at the western end of Martha's Vineyard, and of other points on the south coast of New England, have in days past been famous whalemén, and were often found filling the position of boat-steerer, particularly on the New Bedford ships.

6. THE BRITISH-PROVINCIAL FISHERMEN OF NEW ENGLAND.

There were in 1880 about 4,000 men, natives of the British Provinces, employed on our fishing vessels. They are, as a rule, natives of Nova Scotia, though there are many from Cape Breton and Prince Edward Island, and a considerable number from other parts of Canada and from Newfoundland. The Nova Scotians are, for the most part, of Scotch descent, while the Newfoundlanders are Irish. Many from Nova Scotia and Cape Breton have a share of French blood in their veins. They are all known by the general name "Nova Scotians."

SEAMANSHIP.—A great many of the most skillful fishermen and skippers are from the vicinity of Pubnico, Lockport, Le Have, and Lunenburg, Nova Scotia. These men have an hereditary knowledge of maritime subjects, for there has for a long time been a considerable fleet of bankers owned in that Province. Many other excellent men come from other parts of Nova Scotia, Cape Breton, and Prince Edward Island.

IMMIGRATION.—According to Capt. Epes W. Merchant, of Gloucester, the first Nova Scotian came to that port about the year 1828, on the fishing schooner commanded by Capt. Elisha Oakes. As will be shown hereafter, the practice of enlisting Newfoundlanders was common as early as 1648, and has doubtless continued ever since to greater or less extent.

Capt. Fitz J. Babson, the collector of customs at Gloucester, in a letter to the Chief of the Bureau of Statistics in 1875, says:

"For some years there has been a large immigration of male adults coming from the Provinces to engage in the fisheries of Gloucester. They are mostly young men and unmarried. The superior class of vessels belonging to this port employed in the fisheries, the liberal and excellent quality of provisions furnished by the owners, the prompt settlement and payment in cash for the fares obtained instead of payment in goods, &c., which is the usual manner of payment to fishermen at other places, the rapid promotion to the command of a fine schooner consequent upon skill and success, all conspire to draw the ambitious young seamen from the Provinces.

"These immigrants make up to a large degree the crews of our fishing vessels, and hence the loss of life falls principally upon them. If the loss of life were confined to the native population of the town, Gloucester could not long maintain the fishing business.

* Thaxter's Isles of Shoals, 1873, p. 74.

"The capital of the Provinces finds better investment in building, equipping, and running vessels in the foreign trade than in the fishing business. Most of the fishing of the Provinces is pursued in small boats off shore. Many fishermen of the Provinces do not have sufficient capital to build and equip vessels to carry on the fishing business as it is done here. Persons wishing to engage in the fisheries usually apply first at Gloucester. Of the seven thousand men employed in the fisheries at this port three-fourths are not natives of the town, and this season the Provincial fishermen have come direct in vessels to Gloucester rather than by cars, or via Boston and other ports. Very few of these persons return to the Provinces to make their home there again."

Many young women come from the Provinces to the States on the American fishing vessels, in parties of from two to six or more. The passage is generally given to them free, and they are kindly and respectfully treated. Many come as passengers on the same vessels with their husbands or brothers. Large numbers come every year to Gloucester to seek employment, and many of them ultimately marry their countrymen among the fishermen.

THE CAUSES OF IMMIGRATION.—The causes of this immigration may be found primarily in the poverty of many of the coast districts of that Province. In certain of these coast districts the people are to a large extent dependent upon the summer visits of American fishermen. In the winter of 1867 and 1868, for instance, the suffering for want of food among the Nova Scotian fishermen is represented to have been very intense. Government aid and the charity of individuals were insufficient for its relief.*

Another inducement to the enterprising young Provincials is the opportunity for rapid advancement which may be found in a large American fishing port. A man of energy and courage may in a very few years become the skipper of a fine schooner, and be earning a good subsistence for his family, who, had he remained at home, would still have been plying his oars and line in the monotonous, profitless shore fishery.

"Among the Nova Scotians," writes Mr. George H. Procter, "may be found some of the smartest skippers of the fleet. These have made good use of the opportunities presented, and by their good qualities as seamen, capacity to handle a vessel, and possessed with sufficient daring to run the risks of winter fishing, they have attained good positions. Many of them, who came here with scarcely a dollar in their pockets, are now owners, or part owners, of vessels, showing an energetic spirit of industry and perseverance, which has surmounted difficulties and brought, as a reward of their toil, good returns.

"These men, as a class, are naturally fitted for the business. Born and reared by the sea, most of them of poor parents, it became a necessity for them to earn their own living at a very early age. Fishing was about the only occupation in which they could engage in the Provinces, and in this branch they commenced, bringing to it all the energies of youth, and by its pursuit laying the foundation of robust health, which enabled them to bear the toil it demanded, and preparing them for the more advanced positions which were offered on board the American fishing vessels.

"The yearly visits of our fishing fleet into the Provincial waters show these men the contrast between the two classes of vessels, American and Nova Scotian; the one, clipper-built and well appointed in every particular, and the other, clumsy and far behind in all the modern improvements and fittings. It is not strange that they had a desire to connect themselves with the better class of vessels, where opportunities for becoming masters and owners were so temptingly held out as the reward of industry, fidelity, and daring to venture for a trip of fish at the most dangerous and inclement seasons of the year. They caught the inspiration of the Yankee fishermen, as they

* Barnstable Patriot, March 24, 1868—[with many interesting details].

associated with them in their summer visits after mackerel, and learned of the winter fishing on Georges and the Banks; of the chances to make profitable trips; the opportunities to get ahead in the States; and the advantages for their children to obtain an education. They also learned how well the vessels were provisioned. All this led them to seek for chances on board our vessels, and we have drawn from the Provinces hundreds of their population, representing all grades, with a good proportion of really valuable men, who to-day are numbered among the energetic and thriving citizens of Gloucester."

Again, the system of oppression, to which the fishermen of many parts of Nova Scotia are subjected by the fishery capitalists, has had a very important influence in inducing them to seek other homes.

CANADIAN FISHERMEN AT HOME.—Napoleon Lavoie, esq., a Canadian fishery officer, in his report made in 1875 upon the Gaspé and Bonaventure divisions on the Gulf of Saint Lawrence, gives the following account of the condition of the population in that region, which explains in part the causes of the extensive immigration :

"Changes are so few and the rate of progress so slow on the extent of coast placed under my charge, that it is a very difficult thing to present my annual report under a new dress and to suggest matters which have not already been a frequent subject of allusion. There are, however, certain things which require urgent action and which demand continuous public attention. If the large divisions of Gaspé and Bonaventure, with the exceptional advantages presented by reason of their location on the rich shores of Bay des Chaleurs, have only a population of 30,000 souls, most of them neglectful of agricultural pursuits, such a slow rate of progress must be attributed to causes which I have in several instances already brought under your notice, and to which I must again call your attention.

"The actual settlement of the coast of Gaspé and Bay des Chaleurs hardly dates one hundred years back. Scarcely had it begun when powerful firms repaired thither from the Island of Jersey to take advantage of the labor and resources of the growing population. The ignorance and improvidence of the settlers, which repeated experience has not yet cured, unfortunately made them easy tools to the cunning and cupidity of merchants, who took advantage of their own supremacy to keep them in a state of comparative bondage. The policy adopted by the founder of one of these firms, that of Robin & Co., could possibly bring no other results than those witnessed at the present time. This far-seeing man understood at once that in order to keep these people under his power they should be prevented as much as possible from following agricultural pursuits, which would have insured a certain amount of independence. He therefore became purchaser of the seigniories of Pabos and Grand River, and subsequently deeded this land to the people at the rate of ten acres each. In spite, however, of the endeavors made to keep settlers tied to their fishing boats the soil is so fertile and the climate so favorable to agricultural pursuits that remarkable progress has been noticed in late years. The returns, however, of the last four or five years show that agricultural products have had a tendency to decline rather than to increase, although there has been no decrease in the population. It must not be lost sight of that public works, lumbering operations, railways, salmon and lobster canning establishments employed a large number of hands, which thus were lost to agriculture. On the other side the want of markets for the sale of farm produce is a further impediment to the progress of agriculture, the only purchasers being the Jersey merchants, who buy at low prices in order to supply fishermen. Even farmers themselves dare not sell on credit, as they would be sure to lose the amount of their debt, the merchants compelling fishermen to give them all their fish.

"Another reason why agricultural pursuits are more neglected now than they used to be is the

bad system of engaging fishermen. Up to five or six years past the majority of this class hired themselves only until the 15th of August, for what was called summer fishing, the proceeds of which went altogether to merchants in payment of accounts. On the 15th of August, let the bills be settled or not, fishermen began working for themselves, and were thus enabled to purchase their winter provisions wherever they liked, the fish being usually sent to Quebec. Thus they eked out a living, and, working at home, were enabled to cultivate a little plot of ground, which yielded a small return for their industry. The Robins, however, soon found out that this system made the fishermen a little too independent, and anticipating a chance of tightening the bonds under which they were kept, gradually changed their mode of engagement to another, which the improvident and too confiding fishermen adopted without paying sufficient attention to its effect. The mode of engagement now followed on the coast of Gaspé is the half-time system. Most of the fishermen are sent to the large establishments of Percé, Newport, Pabos, and of the North Coast, to fish there until the end of August or September, so that when the fishing is over there is hardly anything left for them to do. The weather is apt to be so stormy at this period of the year that weeks may elapse before they are enabled to fish, and there is no occupation for them on shore.

"This system, which at first sight may seem advantageous, is nevertheless disastrous to the fishermen, as it prevents them from cultivating their small plots of land, and compels them to procure everything from merchants, who are thus enabled to take advantage of the position in which they are placed. This system is still more prejudicial in so far as it increases the exports of Jersey firms, thereby diminishing the supply on our markets and enhancing the price of codfish. It is also, as may be easily understood, ruinous to the coasting trade.

"There is no need to repeat here what I wrote last year about these firms, their mode of trading, and their narrow and ambitious views. What I then said and what I write to-day will, I venture to say, be sufficient to enable you to understand the position of a large and wealthy portion of our Dominion, the situation in which is placed a whole population reduced to an undisguised state of vassalage, the want of resources and education affording them no means of resisting this oppression. It is certainly not useless on my part to try once more to urge your solicitude towards this unfortunate class of our own people, whose position is an anomaly of the age in which we live."*

In the winter of 1861-'62 there was great destitution and suffering among the Newfoundland fishermen, particularly those living about Placentia Bay, owing chiefly to the poor fishing in the summer of 1861.†

TRANSIENT FISHERMEN.—A great many fishermen are every year shipped by American vessels in the Provincial seaports, and a considerable proportion of these men, though yearly making up a part of the crews of our fishing fleet, never became residents of the United States.‡

THE FISHERMEN OF NEWFOUNDLAND.—The following account of the Newfoundland fishermen gives an idea of their peculiarities, most of which are retained by the men of that region who enter the American fishing fleets:

"The speech of the Newfoundland fisherman is full of phrases derived from his every-day employments. To make an engagement for a term of service is to 'ship' with Mr. So-and-so. Even servant girls are said to 'ship for six months' when they engage with a mistress. A young man 'ships' himself to a sweetheart when they are affianced; and a church is said to have 'shipped' a

* Report of Commissioner of Fisheries of Canada for 1875, pp. 39, 40.

† Cape Ann Advertiser, January 24, 1862.

‡ The Gloucester Telegraph of June 8, 1870, remarks: "Our correspondent at Port Hastings, Cape Breton, sends us the following fishing items: Schooner Yazoo, of Provincetown, Captain Morrison, arrived here May 21; took men and supplies and sailed north on a fishing voyage 27th. Schooner Julian, of Provincetown, Captain Donlin, arrived 21st and took men and supplies for a fishing voyage to Grand Bank. Schooner Oriola, of Provincetown, Captain Donlin, arrived 21st and took men and supplies for a fishing voyage to Grand Bank."

new parson, or perhaps he is called the 'skipper' of the church. The master of the house, whatever his occupation, is invariably 'the skipper,' and the mistress is 'the woman.' 'How's the woman?' is the usual way in which a man is asked regarding the health of his wife. Gaining an advantage over a man is called 'getting to windward of him.' 'Mr. Blank is a terrible knowin' man; there's no gettin' to windward of him.' Is a man prosperous, he is said to be making 'head-way'; if the reverse, he is 'going to leeward.' To initiate any undertaking is described as 'getting it under way'; and to live meanly and parsimoniously is to 'go very near the wind.' There is a world of meaning in the Newfoundland proverb, 'the big fish eat the little ones.' Thus pithily and with a sort of mournful cynicism do they at times describe their own forlorn condition at the end of a fishing season, when, in payment of their debts, the whole proceeds of their toil go to the store of the wealthy merchant, while they are half starving during winter.

"Of profitless talk, it is said in reproof, 'words fill no nets.' A dull, plodding man, who succeeds in spite of deficiency by honest industry, is said to 'get on by dint of stupidity and hard work'—a most expressive description.

"Another peculiarity of the Newfoundland fishermen, derived from their sea-faring habits, is an inordinate fondness for flags. Every merchant has his flag flying on his storehouse or wharf, as though a state of active warfare existed, while at the principal harbors the approach of each vessel is signaled by a flag, be it schooner, brig, brigantine, or ship. On Signal Hill, overlooking Saint John's Harbor, three masts are erected, and at times, when a number of vessels are approaching the port, these, with their yards, look like a draper's shop, with the various flags streaming in the wind. Flags, however, are utilized in other ways. When any important personage has 'crossed the bourne whence no traveler returns,' the flags are hoisted half-mast; but when a wedding takes place, all the bunting in the place floats in the breeze. Big 'sealing guns' [used in shooting seals on the ice], whose report is like that of small cannon, are brought out and fired continuously, and evidently afford the greatest delight on these joyous occasions. In the 'outports,' as all places but Saint John's are named, it is usual to catch the happy couple in a net as they emerge from a church—a symbolic net, perhaps—indicating that both are netted for life. In these 'outports,' too, church bells are few and far between, and the time for each service is indicated by hoisting on a pole a flag, on which is emblazoned the miter or the cross. Each school-house, too, has its flag-staff, and when the flag is hoisted the urchins are seen coming along the paths, 'creeping like snails unwillingly to school.'

"Near the shores Newfoundland is rocky, the ground being everywhere covered with stones of all sizes. The word 'stone,' however, is rarely used, the smallest pebble and the largest boulder being alike called a 'rock.' Boys invariably speak of 'firing rocks,' but never of throwing stones. A servant was asked how she had been spending her time lately. Her reply, 'Why, I have been heavin' rocks out of them raisins for the best part of an hour.' Thus 'stoning fruit,' is 'heavin' rocks' in Newfoundland. So abundant are the rocks in some places and so scanty the soil that suitable ground for the burial of the dead cannot be found; and amid huge boulders the graves are made by soil brought from a distance; or, where this is not possible, the coffin is laid upon the rock above ground and then walled in and covered. It is not very uncommon for graves to be dug less in depth than the coffin. Of course this is true only in certain localities.

"Among the primitive population of the 'outports' there is, among the Protestant portion, a wonderful passion for choosing names taken from the Old Testament, and these at times the oddest and most uncommon they can select. Israels, Reubens, Daniels, Azariahs, and Isaiahs are plentiful as 'rocks.' But it is rather startling to be introduced to Miss Lo Ruhamah Tucker, or Miss Lo-Ammi Squires, and to be told that the little flaxen-headed girl you are trying to make

friends with rejoices in the name borne by one of the daughters of the patriarch Job, Keren-happuch, or that the baby's name is Jerusha. To those not quite familiar with Scripture names it may be well to say that the first two are to be found in Hosea, I, 6, 9. It is on record that one child was baptized Beersheba, entered in the marriage register in due time as Bathsheba, but always called Bertha by her neighbors. A clergyman of the Church of England relates that once in beginning a service in a private house in an 'outport' a woman near him, intending no offensive familiarity, lifted up a corner of his surplice, and, after examining it with finger and thumb, pronounced it aloud, 'A beautiful piece of stuff.' Under similar circumstances he was startled on another occasion, in the middle of his sermon, by an old woman in the chimney corner calling out to some young ones, 'My gracious, girls, I've forgot the loaf! Julia, go out to the next house and hang on the bake-pot.' It must be understood that these instances occurred in some of the primitive outlying settlements, far from the center of civilization, where the people seldom see a clergyman, and are quite unaccustomed to the solemnities of religious assemblies. They welcome eagerly the rare visit of clergymen in these scattered hamlets, and whole batches of children of various ages are baptized by him at the same time. So cold is weather in winter, in the more northerly parts of the island, and so wretched their houses, that, in order to keep the loaf from freezing at night, it is a practice to wrap it in the blanket and take it to bed when retiring.

"The population is a mixed one, nearly half being the descendants of Irish settlers, the rest English; most of them sprung from progenitors who came originally from Devonshire, Dorsetshire, and Hampshire. The descendants of the latter retain many of the peculiarities of speech which still distinguish the peasants of Devonshire. They say, 'I's took no notice to she,' that is, no notice of her. 'Did 'ee want anything wi' I?' They speak of their 'handses and postses;' of their cows being 'alossed,' and their bread 'amade.' They will say 'Mubbe I's gown home.' The parson is 'pareson,' and they ask him to 'bide a spurt' with them. A 'spell' is either short continuance at labor or a time of rest. Short distances are, in common speech, measured as 'spells.' Thus 'two shoulder spells' is a distance a man would ordinarily carry a burden on his shoulders, resting once in the midst. The word 'obedience' is sometimes used for 'obeisance.' Thus, children are directed to 'make their obedience,' that is, to bow courtesy. The inhabitants of a settlement are called 'liviers,' and if any district be uninhabited there are said to be no 'liviers' in it. An expressive phrase is used to indicate a fall in the temperature—'To-day is a jacket colder than yesterday.' 'How do times govern in Saint John's?' is a common question which is answered by recounting the prices of fish, oil, and provisions. 'Praise the fair day at e'en,' is the Scottish proverb which has its counterpart in Newfoundland, 'Praise the bridge that carries you over.' The folly of lazy, shiftless expedients is well expressed by saying 'He sits in one of the tilt and burns the other.' When admiration of a benevolent man is expressed, he is described as 'a terrible kind man;' or the weather is commended by saying, 'It's a shocking fine day.' Clever, in Newfoundland, means strong or large. A 'clever man' is a stout, large man. A 'clever baby' is a hearty, big baby. A singular use of the word 'accommodation' is common. A person of bad repute is said to have 'a very bad accommodation.' Or a servant on leaving his master requests 'an accommodation,' evidently a corruption of recommendation.

"With all their primitive and often amusing peculiarities and local customs the fisherfolk of Newfoundland have many sterling qualities of head and heart; and all they want to put them on a level with corresponding classes in other countries more advanced in the arts of civilized life is education. No one could live among them without liking them. In simplicity of character, warmth of heart, kindness, and hospitality, they are unsurpassed.*

* Cape Ann Advertiser, January 15, 1875.

FISHING VILLAGES OF NEWFOUNDLAND.—A writer in Harper's Magazine for 1854 writes:

"Fishing, or some process connected with it, is the occupation of almost every man, woman, and child in the country. Out of Saint John's, either fish or some sign of the finny tribe, visible or odoriferous is met with wherever there is a population. At a distance from the capital, in the small settlements, the fishermen live in unpainted wooden cottages, scattered in the coves, now perched upon rocks or hidden in the nooks, the neighborhood showing small patches of cultivated garden ground and copses of stunted wood. Each cabin has its fish flake, a kind of rude platform, elevated on poles ten or twelve feet high, covered with a matting of sticks and boughs, on which the fish are laid out to dry. At a convenient point on the shore is a stage, much more strongly constructed, jutting out over the water. It forms a small pier, made in part to serve the purpose of a ladder, at which a landing frequently is alone possible on the steep and rock-bound coast.

"On returning from the fishing ground, the boat is brought to the stage with the cargo, and sticking a prong in the head of each fish, they are thrown upon the stage one by one, as hay is pitched into a cart. The operations of cutting open, taking out the entrails, preserving the liver for oil, removing the backbone, and salting, are immediately performed upon the stage, in which the younger members of the family are employed. The drying on the flakes is the last process.

"It is the inshore fishery that is prosecuted by the British, not extending generally more than a mile or two from the harbors, that of the Great Bank being abandoned to the Yankees and French."

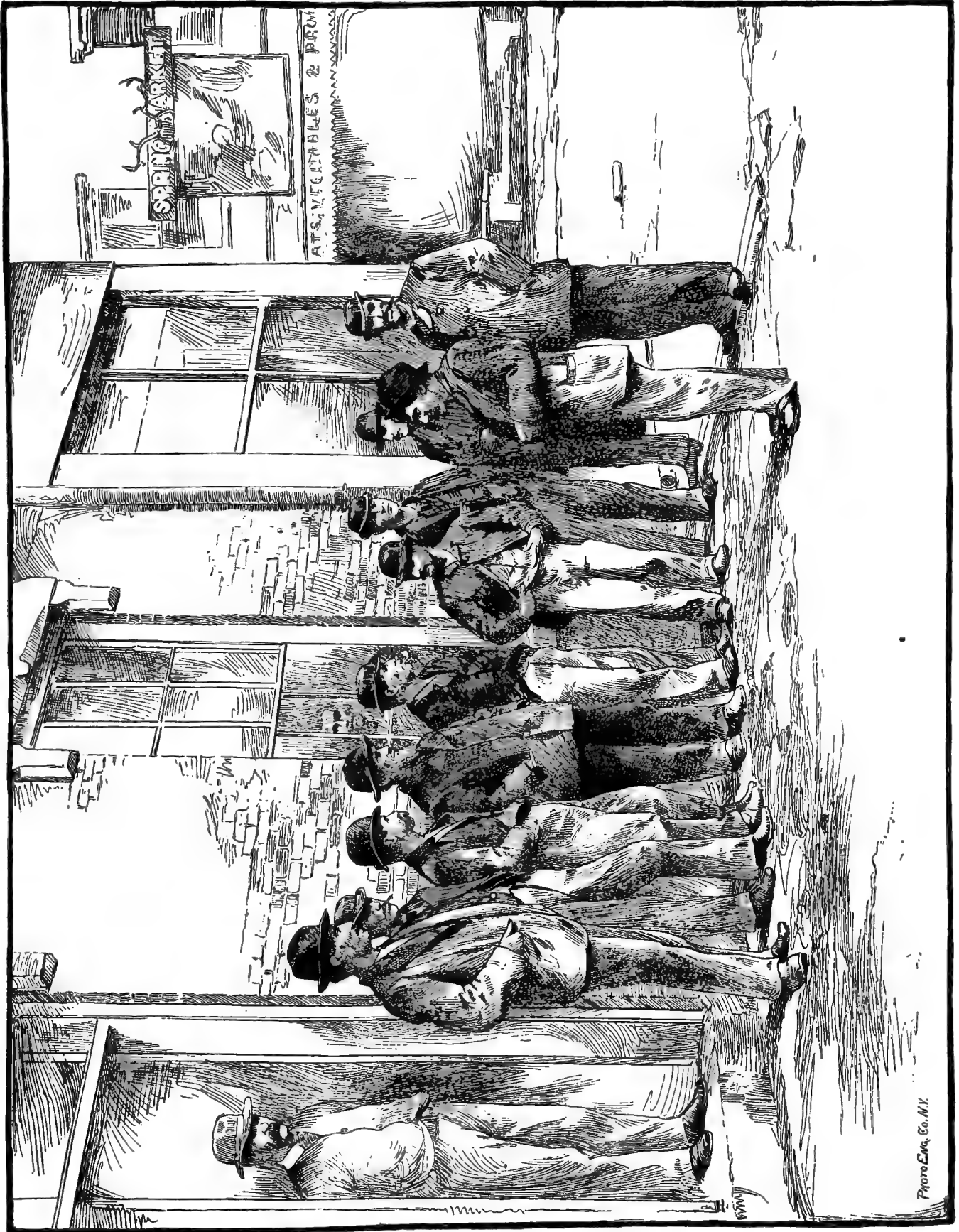
EARLY ENLISTMENT OF NEWFOUNDLANDERS IN THE FISHERIES OF NEW ENGLAND.—The following extract from Hubbard's History of New England, referring to events which took place in 1648, shows that fishermen from the regions now designated as the British Provinces, participated in the fisheries of New England at that time:

"Some of these petitioners being bound for England, their papers were searched by the authority of the governor and council, amongst which were found the copies of some petitions and queries to be presented to the commissioners for plantations. One petition was from some non-freemen, pretended to be in the name, and upon the sighs and tears, of many thousands, &c. In the preamble they showed how they were driven out of their native country by the tyranny of the bishops, &c. One of their petitions was for liberty of conscience and for a general governor. They had sent their agents up and down the country to get hands to this petition, but of the many thousands they spake of, they could find but twenty-five hands to the chief petition, and those were, for the most part, either young men who came over servants and never had overmuch shew of religion in them or, fishermen of Marblehead, feared to be profane persons, divers of whom were brought the last year from Newfoundland for the fishing season, and so to return again. Others were drawn in by their relations, and those depended upon for means how to live."*

7. THE IRISH FISHERMEN OF NEW ENGLAND.

IRISHMEN IN THE GLOUCESTER AND BOSTON FLEETS.—There are many Irishmen in the Gloucester fleet; among them are individuals who have distinguished themselves by their skill as fishermen. As a rule, however, these men, as well as those of Irish descent who have come from Newfoundland, are from the peasant classes, and are remarkable rather for stolidity, indifference to danger, and endurance of hardship, than for enterprise and activity. They are most likely to be found among the crews of the George's-men, the dull monotony of hand-lining being better suited to their temperaments than to that of the Americans, who prefer the cleaner, safer,

* Hubbard's History of New England, from the discovery to 1680. Boston: 1848, p. 515.



Portuguese from Azore Islands, engaged in George's Bank cod fishery from Gloucester, Mass.

From a photograph by T. W. Smillie.

variable, and more nervous employment of mackerel catching, or the more remunerative and exciting experiences of the fresh-halibut fishery.

The Irish fishermen are often clannish, and an Irish skipper soon gathers around him a crew of his own nationality. Vessels thus manned are not noted for their trimness and neatness.

At Boston there is a considerable fleet of market boats owned and manned entirely by fishermen from the west coast of Ireland. Their boats are built precisely like those of Galway and they employ their own home methods. This fishery is described at length elsewhere. A number of these Irish boats may be seen at any time in the docks at Commercial or "T" Wharves, Boston, and it is doubtful if anywhere else in this country can be seen so unadulterated a representation of Irish peasantry as in the old fishermen who sit about the docks counting their fish and chatting in Gaelic.

8. THE SCANDINAVIAN FISHERMEN OF NEW ENGLAND.

SCANDINAVIANS IN THE GLOUCESTER FLEET.—There may be found among the Gloucester fishermen a large percentage of Scandinavians, mostly Norwegian, a considerable number of Swedes, and a few Danes.

They are intelligent, enterprising men, a large proportion of whom rise to the command of vessels. In many of their traits they resemble the fishermen of New England birth. Strong, accustomed to hardship, skilled in the management of small boats from long experience inherited and personal at home, they are best suited for trawling and hand-lining from dories. The schools of Norway and Sweden have taught them navigation thoroughly and most of them are excellent sailors, having served frequently in the merchant marine. Many of these men have families, having brought their wives with them from home, or married their countrywomen who have come over alone. They soon learn to speak English.

9. THE PORTUGUESE FISHERMEN OF NEW ENGLAND.

PORTUGUESE FROM THE AZORE ISLANDS.—The so-called Portuguese fishermen of New England are, with few exceptions, natives of the Azores or Western Islands. Their attention was doubtless directed to this country by the visits of the Cape Cod vessels to their islands. A favorite cruising ground of the Provincetown sperm-whalers was the "Western Ground," which is situated off the Azores. These vessels, as well as those of New Bedford and Nantucket, have for nearly three-quarters of a century been accustomed to touch at Fayal to recruit, to land sick men, and to ship home oil. Extra hands were often shipped at the islands to fill up the complement of the crew or to fill the places of deserters. Many were brought home in the whale-ships, and, as a consequence, some of the more enterprising began to bring over their families. A great impulse was given to their emigration in 1853, when the growth of a fungus devastated the vineyards and the wine crop of the Azores began rapidly to fail.

PORTUGUESE COLONIES IN NEW ENGLAND.—The largest colonies are at Provincetown, where there are numerous families established, and four hundred of the fishermen from this port are Western Islanders. At Gloucester, also, there is a considerable colony at "Portugee Hill," and about two hundred and fifty Portuguese fishermen in the fleet. There are many Portuguese families living at New Bedford and about eight hundred of the whalemén sailing from here are of this nationality.

CHARACTERISTICS OF PORTUGUESE FISHERMEN.—The Portuguese at sea are industrious and daring, having been accustomed for generations to lives of hardship and adventure in the boat fisheries at home, and by instinct sturdy laborers and frugal economists. They make good cooks

or "stewards," and are often found serving in that capacity. On shore they live in little homes of their own, built together in small communities, they mingling scarcely at all with their American neighbors, and rarely, if ever, going out to service. Men are absent in summer at sea, and in the winter engage in the shore fisheries. The women and children contribute to the general prosperity by gathering berries and beach plums for sale, and by small household industries. In Provincetown they are rather looked down upon and avoided by the native population, but this is apparently the result of race prejudice, for they are honest and unobtrusive. They are always self-supporting and often well-to-do. At sea the men are recognized as equals by their shipmates, and there are few vessels which have not among their crews some "Manuel" or "Antone" who talks a dialect of Latin-English and serves as a stimulant to ethnological speculations among his shipmates. The women are not so much in intercourse with Americans as the men, and usually speak English with difficulty. They are always devout Catholics and make up at Provincetown and Gloucester a large part of the congregation in the churches of this sect.

Of late years a number of Portuguese have become skippers of Gloucester vessels and part owners as well. There was formerly a prejudice against allowing them to take these positions, but this is now vanishing. A Portuguese skipper rarely has any but Portuguese in his crew. As a class they seem to prefer the George's cod fishery to the other fisheries, more than two-thirds of all the Portuguese fishermen of Gloucester in 1879 being in the George's fleet.

10. THE NEGRO FISHERMEN OF NEW ENGLAND.

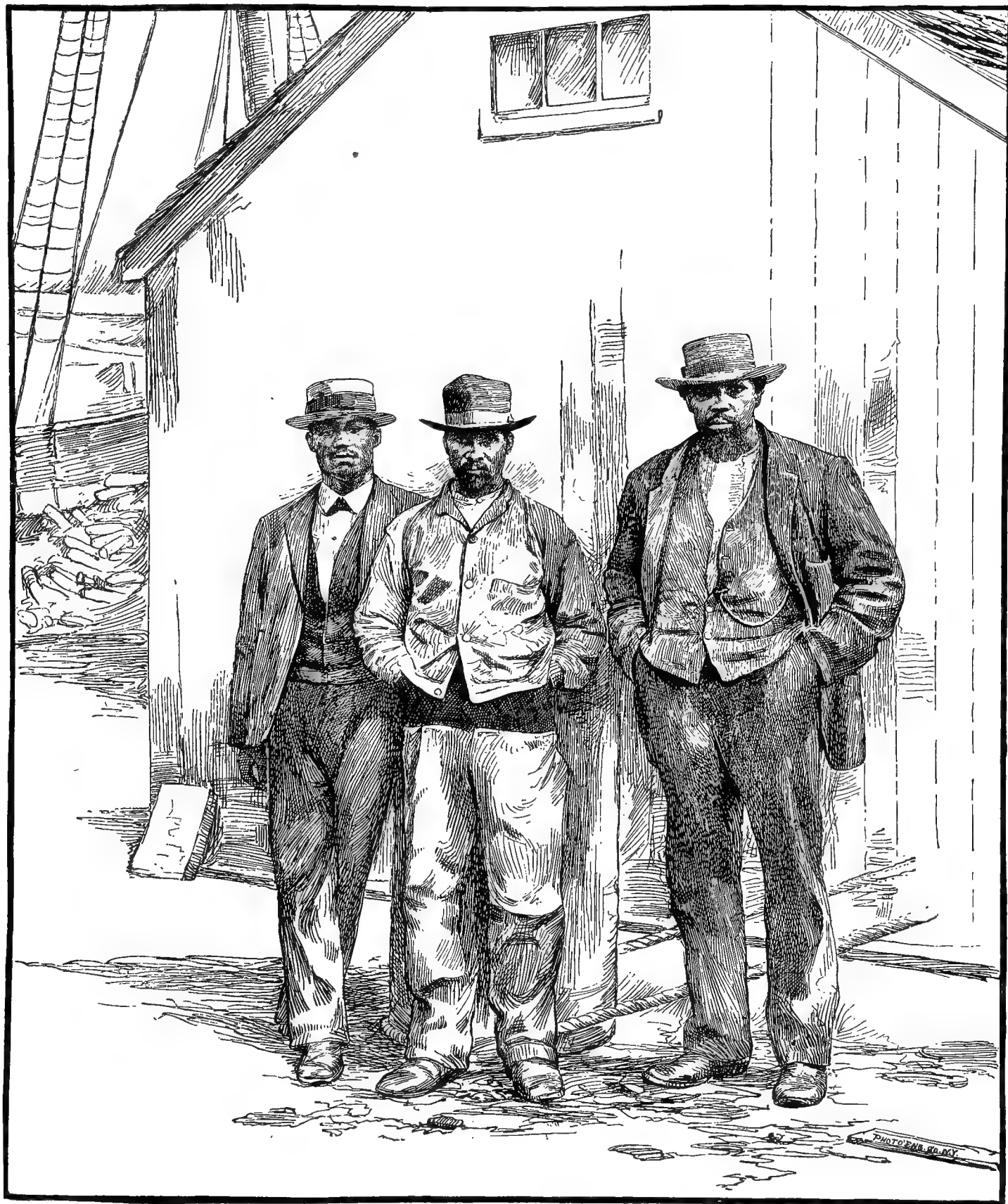
NEGROES AS WHALEMEN.—New England has few negro fishermen except in its whaling fleet, though occasionally one is found serving as cook on a cod or mackerel schooner. In 1880 there was not a negro among the 4,500 men in the Gloucester fleet.

The whaling fleet of New Bedford has among its crews many negroes, some shipped in the West Indies, others picked up at Zanzibar and other recruiting stations. In 1880 there were two hundred negroes in the fleet.

The Provincetown whalers often ship a part of their crew at Jamaica, St. Croix, or other of the West India Islands. These negroes are rarely of mixed blood, and are active, powerful men, speaking a *patois* hardly to be understood even by those who are familiar with the speech of the negroes of their own States. Negroes sometimes attain to the position of boat-steerer, but I have been unable to learn of instances where they have become captains or even mates.

11. THE "BAYMEN" OR FISHERMEN OF LONG ISLAND.

THE HABITS OF "BAYMEN."—The character of the fisheries of Long Island, New York, is such that it is a most difficult matter to determine how many men are professionally engaged in them. The men who fish are also by times oystermen, farmers, clammers, yachtsmen, and gunners, following either of these occupations as they may feel at different times inclined. On the south shore, and in some other parts, they style themselves "baymen." Many of them own yachts of from 3 to 20 tons, are good sailors, and keep their boats neatly painted, so that when taking out parties of anglers to fish for bluefish or other fishes their boat would hardly be thought to have been engaged in oystering most of the winter. This class of men are very numerous in all parts, and while individually they take but few fish, collectively their catch amounts to considerable in the course of the year. These "baymen" get from \$3 to \$5 per day for sailing a party, and usually get all the fish, although they do not demand it as part of the contract, as is the case at some places on the New Jersey coast.



Portuguese from Cape de Verde Islands, engaged in whale fishery from New Bedford, Mass.

From photograph by T. W. Smillie.

The men engaged in the menhaden fisheries are drawn from all parts of the island, are generally sons of farmers, and, with the exception of the captains of the steamers, engineers, and the superintendents of the factories, are not usually in the business more than a season or two.

MORALS.—The people who are engaged in the Island fisheries have more the manners and appearance of farmers than of the inhabitants of the exclusively fishing towns of the Eastern States, and they will compare favorably in regard to education, thrift, and morals with most rural populations. I think that these virtues increase with the number of miles between the villages and New York City, and that there is also a difference between the north and south sides in this respect which may have had some influence on the selection of so many places of residence by wealthy New Yorkers on the south side, with its flat, low, barren lands, and on the waters of the uninteresting Great South Bay, in preference to the high, rolling north side, with its charming, deep, romantic bays; here there have been more deeds of violence, and among the majority of the native population the language of ordinary intercourse is a shade more profane and loose. We do not mean by this to assert that, even in the district spoken of, these unprofitable vices are in excess of what one often finds in the interior, for most observant men must have noticed that in small villages and country places there is, especially among young men, an affectation of profanity and its accompanying vulgarity which seems strained to a city-bred man, and at first astonishes him when heard from any but the vilest of men. To those who have been much among soldiers, sailors, and fishermen, it is not at all surprising to hear bad language from men who are so well known for their honest and upright conduct that they think that they can afford to be careless in respect to this, a point which, however, impresses the stranger unfavorably.

HOMES.—The dwellings of the fishermen are generally neatly painted and comfortable; their families well dressed; and it is rare to see an exception to this rule, for the varied pursuits included in the list of labors by which a Long Island fisherman earns his living afford him a change from one which is temporarily dull to something better and find him employment of some kind the year around. When fishing is dull he turns his hand and boat to oystering, and if these are out of season the hard or soft clam offers him remunerative employment.

12. THE OYSTERMEN OF MARYLAND.

OYSTER DREDGERS.—There are two distinct classes of oystermen on the Chesapeake Bay, namely, dredgers, and scrapers or tongs. The business of oyster dredging is carried on by about 5,600 daring and unscrupulous men, who regard neither God nor man. The characteristics and habits of these men are discussed, in connection with the oyster fisheries of Maryland, in Section III of this report. Mr. Edmonds there describes them as among the most depraved bodies of workmen to be found in the country. They are "gathered from jails, penitentiaries, workhouses, and the lowest and vilest dens of the city."

OYSTER TONGERS.—The oyster tongs or scrapers are, both socially and morally, somewhat superior to the scrapers, though, as a class, indolent and improvident. Mr. Edmonds, in the section above referred to, also discusses the characteristics of this class of oystermen. The oyster laws of Maryland require every vessel and boat engaged in gathering oysters to be licensed. The amount received from tonging license must be paid by the clerk of the circuit court of the county "to the school commissioners for the public schools of the respective counties where such license is issued; provided, the sum received from white tongs shall go to white schools, and the sum from colored tongs to the colored schools."

DREDGERS AND TONGERS COMPARED.—The two classes may thus be briefly contrasted:

The oyster-dredge-fishermen of the Chesapeake are almost entirely whites of the lowest order.

The oyster tongers are one-third negroes, and the other two-thirds white fishermen, small farmers, and truckers.

The number of men in a crew of a dredger averages eight; in the crew of a scraper, not more than three. The total number of men employed in dredging equals 5,600, and in scraping 5,148. The average returns for a season for each dredger is \$175; for each scraper, \$225.

13. THE OYSTER-SHUCKERS OF MARYLAND.

OYSTER-SHUCKERS.—There are nearly 10,000 persons employed in oyster-shucking in Maryland, about two-thirds of the number being males, and the rest females. Their aggregate annual earnings are about \$800,000. About three-fourths of the men are negroes, and they are, as a rule, steady workmen, while the whites are disposed to be idle and intemperate. Nearly all the females are employed in the steam oyster-houses of Baltimore. They are mostly white girls of foreign parentage, and range in age from eighteen to twenty-five years, the proportion of older ones, as of colored, being small.

14. THE FISHERMEN OF FLORIDA.

BY SILAS STEARNS.

FISHERMEN OF KEY WEST.—The majority of the fishermen of Key West are descendants of the Bahamians who have lived on the island for many years, or are quite recently from the Bahama Islands.

The remainder are Cuban Spaniards, negroes from the West Indies, and the usual sprinkling of Irish, French, Germans, and Swedes, who are found everywhere in this country.

There are some few fishermen from the North Atlantic States, but they do not form so prominent a class as the "Bahama Conchs," or the "West Indian negroes."

The Bahamians, both black and white, have been brought up on the water, and are probably the best boatmen and fishermen in this region. They know no other professions than fishing, sponging, turtling, and wrecking; and it may be said to be an hereditary profession, since their fathers and forefathers followed the same profession and no others. With the other classes or nationalities it is quite different. They are men who have been drifting about the world as sailors, and have been left here by vessels of all the nations, and for the present have adopted the profession of fishermen.

I can not learn of any disaster happening to the Key West fishermen, beyond an occasional wrecking of some small vessel where no lives were lost. No smacks sailing out of this port have ever been lost.

The manner in which the fishermen live on shore is plain, yet comfortable. The better class, or well-to-do fishermen, are the Bahamians and Americans who have families. They own small, comfortable houses in the city, and have all to eat and wear that other classes of people do.

In society they occupy a good standing, and very often hold responsible and honorable offices in the local government.

Another class, consisting chiefly of young and unmarried men, who are dissipated, and when ashore lead an unprofitable and low life, are looked down upon with contempt and considered a public nuisance. The temperance reform has done great good here, and is rapidly thinning out their numbers.

The older men of all classes are generally very ignorant, but few being able to write their names, but the young people, having fair school advantages, are, as a rule, quite intelligent, and can now transact their own business as their fathers never could.

FISHERMEN OF CEDAR KEYS.—Nearly all of the two hundred and sixty fishermen of this place are Americans or of American birth. The majority of them are men who have been engaged in the different branches of the fisheries on the Atlantic coast, in such places as Chesapeake Bay and coast of the Carolinas, and the balance are natives of West Florida, who have, in most cases, taken up this business quite recently. Taken as a class they are quite intelligent, industrious, and quick to adopt new methods that will tend to facilitate their work.

The Spanish, Italian, and French creoles, who are generally lazy, ignorant, and inclined to keep up old styles of fishing, &c., and are found in the majority at many of the other fishing communities west of Cedar Keys, are not often met with among the fishermen, and are not at all popular.

FINANCIAL PROFITS OF FISHERMEN.—Although they work steadily and well, the seasons for profitable fishing are so short that they do not gain more than a bare subsistence.

There is great wear and tear to the nets also, one man often using up three or four nets in one season. When these nets, perhaps a new boat, and their household expenses are paid for there is little or nothing left to support them during the time that fishing is not carried on. Some are fortunate enough to get other employment, or to be engaged in the turtle fishing, but many are not, and such ones get so deeply in debt to the storekeepers that the profits of the ensuing year are taken to pay them. Nearly all are in debt from various causes, with no prospect of ever getting clear again.

FISHING POPULATION OF APPALACHICOLA.—The fishing population of Appalachicola includes representations of nearly all the nations of the world, the Americans and Spanish creoles being in the majority. Of the older men in this business here, some are Europeans who came in vessels when Appalachicola enjoyed a large cotton trade; others are New Englanders, left by men-of-war at various times, and the rest are natives of the Southern States. Many of the young men are of that class of rovers found aboard all the merchant vessels of this country, who have drifted here in some unaccountable manner, to stay but a season or two and then to continue their wanderings.

Those of the fishermen that are really inhabitants of the place are, as a rule, good citizens in every way. There are but few among them whose fathers had been in the fishing business before them, but the rising generation will probably adopt their parents' profession, perhaps more from necessity than choice. Their health is very good, in spite of the popular supposition that men engaged in sponge-fishing are unhealthy. Sickness is a rare visitor, a touch of biliousness or slight attack of "chills and fever" being the only forms. One captain told me that he had been here ten years, and believed there had not been over a dozen deaths of children from sickness in the whole time. In the fall a few cases of fever and ague occur. While on the water, in the bay, or on the "sponge reefs" a case of sickness is a very rare occurrence. They are not especially remarkable for longevity, but many of the old men of seventy, eighty, and eighty five years of age are still hale and hearty, and in some cases perform hard labor. With the women it is different. They marry young, and when thirty-five or forty are broken down, and appear as though of twice that age. They very seldom live to be over sixty years of age, and the greater number do not reach their fiftieth year. Nearly every married couple has a large family of from four to twelve children. Their dwellings are unusually good, being in most cases houses that were built for men of wealth, when Appalachicola was in its prime; they are not kept up in their former good condition, yet make very comfortable habitations; and there being a small garden attached, are supplied with vegetables and fruits at little expense or trouble. Orange trees thrive well here, and nearly every yard has some of them.

The food used by these people on shore is plain and offering little variety, consisting mainly of fish and oysters. Fresh meat is not much used, salt pork taking its place. While fishing the men generally live in better style, having all the best articles of food that can be bought at the stores. The reason of this is, that *all* the provisions are advanced on credit, and the storekeepers, having the vessel or boat, gear, and catch as security, are willing to advance more than to any one of the ordinary fishermen with a family, who has only his share of the catch wherewith to pay all of the necessary household bills.

The school system is very poor, only the children of the richer people attending, the tuition and outfit of books being too expensive for most of the poor. However, all the children receive some education in various ways, learning to read, write, and figure a little.

Of amusements there are but few, beyond an occasional gathering of old and young at some private house, where dancing and games are enjoyed, with refreshments at the end.

It is a quiet and orderly place. Every one conducts himself in public in a manner that would stand the severest scrutiny. Even the wild young men who, having "knocked about" over the world, are accustomed to all vices, here seem to be awed by the steadiness of others, and carry themselves accordingly.

When any one commits an act which by the authorities of the town is considered disgraceful, or not in accordance with their ideas, they furnish him an old "bateau," and give him but a short time to choose the direction which he shall take.

There are one or two bar rooms, where the old and middle-aged men obtain their "toddy" without comment from others, but if a young man indulges too freely it will never be forgotten or forgiven. Many of the population, comprising the Spanish, Italians, and French, are Roman Catholics, provided with a priest and church, which they attend with their usual regularity. There are two or three Protestant churches, both white and colored, which are also well attended by old and young. It was said by a stranger, who was rather disgusted with the dullness of the place, that "because of having nothing else to do, the people went to church." The funeral of a young man took place since I have been here, and I must say that the men and boys turned out to attend in a manner that surprised me.

I have not met a fisherman yet who can give me an exact statement of his yearly earnings, for they are engaged in many kinds of work, and are idle part of the time. By putting several statements together, I believe I have arrived at a reasonable estimate of the profits of an active fisherman for one year. Let us suppose such a man is very fortunate and has work at all the fishing trades of the place in succession. First comes the sponge-fishing, beginning in March and ending in September, out of which, with good luck, a man may clear \$200. He then is several weeks idle, when he joins a crew fitted out for the fall mullet-fishing. At this he works until the 1st of December, perhaps, clearing \$40 or \$50. The season for shipping oysters has by that time arrived, and as soon as he is back from mullet-fishing he is offered a chance on an oyster-boat. It is probably the last of December before he gets fully to work at oystering, which he follows until March, when the sponging-vessels again fit out. He will make on the oyster-boat about \$75.

Summing up the year's profits, it will be seen that this man makes \$300 clear of his own expenses, with which he clothes himself, and clothes and feeds his family.

15. THE FISHERMEN OF MOBILE, ALABAMA.

BY SILAS STEARNS.

Mobile smack and oyster fishermen are as a class so mixed in nationality that there are hardly two individuals of the same general character. Among them one finds a majority of southern Europeans, while the minority are natives of the United States and northern Europe. There are very few negroes in their number, and when such an one is employed it is as cook on some small oyster-boat or bay fishing-boat. There are but few cases where the profession is hereditary, and in such cases the man is quite sure to be of Spanish, Italian, or Greek descent. The older men in the business are, as a general rule, of foreign birth, but the young and middle-aged ones are Americans. Their health is good, and they are a strong, hardy class of people; I think there is far less sickness among them than among the planters and laboring men on land, who are troubled with all the forms of malarial diseases.

Consumption has claimed many of the smack fishermen during the last four or five years, but whether the disease is brought on and aggravated by cold and exposure or by dissipation is hard to say. Rheumatism is a common affliction among the fishermen, and many of them are nearly helpless with it. The fishermen of this section, when not broken down by dissipation, live to a considerable age, retaining active mental and physical powers to the age of eighty or ninety years. The women, marrying young and rearing large families, are worn out in early life and seldom live beyond their fiftieth year. As the greater number of the fishermen have their homes in the city, they live in about the same manner as other laboring men and mechanics do. Those who have enterprise enough to make a home are of the better-behaved class, and they live quite comfortably, though in summer, when not much fishing is done, the family have a hard time to obtain the necessities of life. The majority of the fishermen do not marry at all, and spend their time ashore in carousing and in the "lock-up."

Very few have any education, and it rarely occurs that a fisherman is found who can read or write. Their children, if their parents live in the city, have good school advantages, and will probably make a better class of citizens. Nearly all who profess any religion are Catholics.

It is impossible to learn the exact profits of active fishermen, but a close estimate can be made. Some months they make \$40 or \$50 and there are many months when they make nothing. Several intelligent men tell me that they average \$1 per day above their own expenses of board throughout the year, with which they clothe themselves and care for their families, if they have any.

16. THE FISHERMEN OF NEW ORLEANS.

BY SILAS STEARNS.

The New Orleans fishermen and oystermen are nearly all descendants of the Mediterranean coast fishermen and sailors, who came to this country years ago to engage in the fishing or fruit trade.

Frenchmen, Spaniards, and Minorcans are probably in the majority, the balance being made up of Italians, Portuguese, Sicilians, Corsicans, Greeks, and there are even a good many Malaysians in their numbers. In nearly every case the fathers and forefathers were fishermen or sailors, and these men follow in their footsteps as nearly as they can in a country so different from that of their ancestors. They even preserve the old style of rigging their boats—a style seen nowhere else in this country.

The old and middle-aged men, as a rule, are very ignorant of anything outside of their profession, and it is quite rare to find one who can read or write. The French are generally more intelligent than the others, having been longer in this country, and seem to gain knowledge more readily than the Spanish and Italian creoles. The Malaysians are also noticeable for their industry and promptness in business matters, and for their quickness to learn. They all retain much of the superstitiousness of their ancestors, which often influences them to their loss. For instance, a party of seine fishermen go into the marsh-bayous at night for the purpose of seining out some good fish feeding-ground. While they are in the act of hauling the seine, they see the suspended balls of light commonly called "jack-o'-lanterns," and which are often found in the swamps or marshes when peculiar gases and state of atmosphere are favorable, whereupon they become paralyzed with fear, and as soon as possible hasten from the spot, believing the lights to represent some evil being. When once frightened from a place in this way it is hard to entice them there again. The clouds, the sky, the wind, &c., have each their peculiar signification to them at times, and they will run no risk when the signs are unfavorable; not that there can be any great risk of their lives, but they seem to fear invisible objects, or that, if the signs are this way or that, they are sure to catch no fish, and therefore do not try.

Nearly all these people are devout Catholics, and attend the services of their church as regularly and promptly as any class of people.

On their boats or at fishing-camps they live quite comfortably, but in rather a peculiar way in comparison with other American fishermen. There seems to be no regular time for anything, either work or recreation.

They work part of the night and sleep a part of the day, and have their meals thrown in at any and all times. The usual plan is to have a lunch at daylight—that is, coffee, bread, and fish—and the work on hand is attended to until about 10 o'clock, when a hearty breakfast is prepared and eaten, after which they sleep until about 4 o'clock in the afternoon, when dinner is served. From dinner-time until midnight, or after, considerable work is done; then come a lunch and more sleep. While at home they live in much the same style, even if working in the markets.

Taken as a class, these people are hardy and strong, seldom having sickness of any kind; even the contagious forms of disease which are so prevalent here in summer are unfeared by them. The men live to a considerable age, and retain their activity to a remarkable degree. But, as is the case in most warm climates, the women here have comparatively short lives. They generally marry at fifteen or sixteen years of age, and, having perhaps reared large families, are worn-out old women at the age of forty-five or fifty years.

17. THE FISHERMEN OF THE COAST OF TEXAS.

BY SILAS STEARNS.

The fishermen of the Texas coast are of much the same class as those of the Louisiana coast, though there seem to be more of Spanish descent than at the latter place. These Spaniards and Mexicans come from Mexico and represent the wandering set of fishermen to be found in every community. As at New Orleans, the Mediterranean countries are well represented.

There are but few negroes to be found among Texas fishermen, and hardly a man from northern Europe or the northern part of the United States.

From all that can be learned it is evident that the fishermen of this coast are very similar to those of New Orleans and vicinity, and therefore it will hardly be necessary to repeat what has already been said. It is probable that the Louisiana fishermen are better off financially, and

live more comfortably than those of this coast, yet there seems no good reason why this should be so, for fish are more abundant in Texas, and bring as good prices. The majority of these men are married and have their homes in the cities or towns near where they sell their catch.

18. THE AMERICAN FISHERMEN OF CALIFORNIA.

The number of Americans engaged in fishing on the coast of California is exceedingly limited, as Prof. Jordan points out in his discussion of the history of the fisheries of this State. The principal fishing towns, San Buenaventura, San Diego, and Wilmington, have grown up entirely within the last twenty years. The Americans introduced the eastern system to some extent, but the more frugal habits of the Chinese and Italians, who enter the field as their rivals, have enabled them to occupy the field to the exclusion of the former, who prefer to turn their attention to more lucrative industries. As is elsewhere pointed out, the markets in this region are very poor, and there is but little encouragement for enterprising men to engage in the fisheries. The fishing of Americans has been, for the most part, confined to seal hunting, shark fishing, whale fishing, trolling in the barracuda season, and similar industries which promise greater returns than ordinary fishing. The first house in San Buenaventura was built in 1860, and in 1870 its houses were nearly all of adobe. The first house about San Diego was built about 1868, while Wilmington arose about 1870. The growth of these coast towns was rapid for a few years. About 1875 it became feverish, and each of the towns went through a "real estate period." Speculation was universal, and hundreds of people came to each town hoping to make their fortunes. Prices were high, and in every department of work about fifteen men were engaged where there is now one. Then came a relapse and a collapse with harder times; there was less speculation and less demand for it. The whale fisheries declined; there were fewer mouths to feed and less cash to buy food, and the fishermen left the region.

19. THE ITALIAN FISHERMEN ON THE PACIFIC COAST.

FROM NOTES BY DAVID S. JORDAN.

In the shore fisheries of the Pacific coast there are engaged three hundred and three Italian fishermen.

SAN DIEGO COUNTY, CALIFORNIA.—In San Diego County, where formerly there was a considerable number of Italians engaged in fishing, there are now none, they having been starved out by the Chinese, who furnished fish to the local market of San Diego at such low rates as to render competition on the part of the Italians impossible. It is not more than ten years ago that the Italian fishermen had the entire business at this place in their own hands. When they left they traveled in a northerly direction.

LOS ANGELES COUNTY, CALIFORNIA.—In Los Angeles County, at Wilmington, there are eight Italian fishermen. They fish in two boats. These boats are not provided with live-boxes; the fish are therefore thrown in a heap on the forward part of the deck.

VENTURA AND SANTA BARBARA COUNTIES, CALIFORNIA.—There is only one professional Italian fisherman in Ventura County, at San Buenaventura. He has a small lateen-rigged boat. He uses two seines, each 240 feet by 10 feet, and one gill-net. His fish he peddles about the town at 6 cents per pound. An Italian shoemaker buys up the catches of some Chinese and Californians and peddles them through the town and among the Ventura Valley farmers, who give vegetables in exchange.

The fishermen in Santa Barbara County are chiefly Genoese, who speak English, French, and

Danish. They nearly all came here from San Francisco about eight years ago. Most of them are Roman Catholics, and, as a rule, are a simple, hearty, honest class of people. They live in reasonable comfort; better than the same class in Italy. Many of them have families, and they are quiet, industrious, order-loving citizens. Their profits are small, nor could they be increased much by catching more fish. Their children are generally bright and active. Many of them speak English and Spanish well, besides French and Italian. The first Italian fisherman who came there, Francesco Cavagleri, arrived in 1835. He made money by supplying a Spanish family of wealth with fish. The Italians with their lateen-rigged vessels came to San Francisco in 1848, and spread southward. The winter storms were too severe, and there were no wharves from which they could fish, so they left, and the Italians now there, five in number, have none of them been residents more than eight years. Their profits are small, and have been since the flush times of 1874-'76.

MONTEREY COUNTY, CALIFORNIA.—The Italians living and fishing in Monterey County are conspicuous in their costume, which consists of black and white checked shirts, red flannel undershirts, gray trousers, black felt hats, golden ear-rings, and high rubber boots. On clear days a large Italian flag waves from their principal house inscribed, "Roma, la capitale d'Italia." Two or three of the nine Italians composing this company at Monterey are married. This company came from San Francisco and settled here in 1873. Georgio Vignosi, the captain, says that some sorts of fish, especially the flounders, have diminished in number, and that the bay has been over-fished. They manage to make a profit, on an average, of from \$5 to \$10 apiece per week. As will be seen by comparison, they make more than the Italian fishermen in San Francisco. They have five sail boats, averaging three-fourths of a ton, and of the usual pattern. One is lateen-rigged, the others sloop-rigged. Besides these, they own three skiffs. They own two hundred pieces of seine, each 240 feet long; some fine-meshed, for the capture of smelt, and some coarse-meshed for taking salmon. They own, in addition, twenty gill-nets, each from 240 to 250 feet long, and forty bunches of set-lines.

SANTA CRUZ COUNTY, CALIFORNIA.—In Santa Cruz, Santa Cruz County, there are fourteen fishermen from Italy. They live in the southern part of the city in detached houses, not forming a fisherman's quarter. They lash their boats, when not in use after hoisting them, to the docks; they do but little fishing in winter, except at certain favorable times, on account of rough weather. At Soquel are three Italians. These own four boats. They ship to San Francisco, and make greater profits than are made elsewhere on the coast.

SAN FRANCISCO COUNTY, CALIFORNIA.—First in importance as the abode of Italian fishermen on the California coast comes San Francisco County. In the city of San Francisco there are probably not less than 220 regular fishermen. About 70 boats are in use here. In 1876 the "paranzelle" was introduced, a drag-net of common use in the Mediterranean Sea.

The fishermen of other nationalities threatened to burn up these nets and the boats used when they were first employed. San Francisco is the only place in this country where this style of fishing has been introduced. There were formerly two rival companies who used these nets; they have now consolidated and divide the profits equally. Each company has three boats and employs 12 or 13 men, one of whom is constantly engaged in selling fish in the market. The stock is owned chiefly by men not actually engaged in fishing. This is divided irregularly, one man owning a net, another a boat, &c. Out of the gross profits are paid first the entire expenses, including provisions of the men, wear of the boats and nets, &c. The remainder is divided into shares, one share to each boat, one to each actual fisherman, and one-half share to each net actually in use. In these

two companies, there being six boats, two nets, and 25 men, the whole is divided into thirty-two shares. The captain sometimes receives one and one-fourth shares.

MARIN AND HUMBOLDT COUNTIES, CALIFORNIA.—In Marin County there are three points at which Italian fishermen may be found: Point Reyes, where are 2 Italians using one boat; at Marshall's, where 20 Italian fishermen live, using six boats; and on the west side of Tomales Bay, opposite Hamlet, where there are three companies of fishermen, chiefly Italians, 12 men in all, using six boats. They ship their fish to San Francisco. The total number of Italian fishermen in this county is 34.

About Eureka, Humboldt County, there are 3 Italian fishermen. At certain seasons some of those engaged in Salmon fishing on the Columbia River, Oregon, come down here for a short time and join in the fishing.

WASHINGTON TERRITORY AND OREGON.—In Washington Territory there are 9 Italian fishermen: 3 at Port Madison, 3 at Utsaladdy, and 3 at Port Townsend, fishing with boat for halibut and dogfish, which they ship to San Francisco or Portland, or else sell in their own town.

In addition to the numbers of Italian fishermen above enumerated and distributed, there are 800 Italians engaged in the Columbia River salmon fisheries, and 400 more in other salmon fisheries, including those of Sacramento River in which 345 Italian fishermen are employed.

These figures give a grand total of 1,513 Italian fishermen in all the regions above discussed.

20. THE PORTUGUESE FISHERMEN ON THE PACIFIC COAST.

THE CAUSES OF IMMIGRATION.—The presence of the Portuguese fishermen in California and New England is explained by Sir C. Wyville Thomson, who, in his "Voyage of the Challenger,"* pointed out the cause of the extensive emigrations of the Portuguese from the Azores shortly after 1853:

"Formerly Pico was the vineyard of the Azores. Previous to the year 1853, 20,000 to 30,000 pipes [from 3,000,000 to 4,500,000 gallons] were exported from the island of a dry, rather high-flavored wine, which commanded a fair price in the markets of Europe under the name 'Pico madeira.' In 1853 the wretched *Oidium Tuckeri* devastated the vineyards and reduced the population of the island, who depended mainly on their wine production for their subsistence, to extreme misery. Nothing would stop the ravages of the fungus. In successive years the crop was reduced to one-fourth, one-eighth, one-tenth, and then entirely ceased, and the inhabitants emigrated in great numbers to Brazil and California. Some few attempts have been made to restore the vines, but up to the present time there is practically no manufacture of wine in the Azores."

Doubtless many of the emigrants also settled in New England, especially the sea-faring portion, where they could have every opportunity of plying their vocation, and their success is referred to in the article on the Portuguese fishermen of New England, while the agricultural portion settled in Brazil and California, countries in every respect suited to their tastes.

THE AZOREANS AT HOME.—The Portuguese, judging from the allusions to some of their peculiarities made by the same author in vol. 2, chap. 1, pp. 45-49, are at home an industrious, unsophisticated, merry, and extremely religious people.

"Their industry and simplicity of life are evinced by the neat appearance which pervaded their 'steadings' and their primitive method of thrashing wheat, which is briefly as follows: The wheat is spread on a baked-clay floor, and two sledges, drawn by a pair of oxen apiece, go round and round 'treading out the corn.' The operation is accompanied by violent good-natured exertions

* Voyage of the Challenger, vol. ii, chap. 1, p. 29.

on the part of the drivers urging the oxen to do their duty, and by a steady resistance on the part of the animals, which, being unmuzzled, find it more attractive to snuffle among the straw for grains of wheat. The sledges are frequently weighed down by a mother or aunt holding a laughing, black-eyed babe."

The high esteem in which they hold religious observances is gathered from the following paragraph taken from pp. 48-50 of the same work:

"In one of the churches of the town* there is an image of our Saviour, which is regarded with extreme devotion. The inhabitants, in cases of difficulty or danger, bring it rich offerings, and the wealth of the image in jewels was variously stated to us at from £1,000 to £100,000, in proportion to the faith and piety of our informants. There had been great want of rain in the island for some months past, and it had been determined to take a step which is only taken in extreme cases—to parade the image round town in solemn procession. * * * The square and streets below us were, for hours before, one sea of carapuças and capotes, male and female, but chiefly the latter, their wearers sitting on the hot pavement, chattering quietly. About 5 o'clock a large number of acolytes in scarlet tunics left the church and formed a double row, lining the streets in the path of the procession. Then came a long double row of priests in violet chasubles and stoles, repeating the responses to a portly brother, who led the column, intoning from his breviary. Then a double row of priests in white, and then a group of the higher clergy in cloth of gold and richly 'appareled' vestments, preceding the image, which was carried aloft under a crimson canopy. The image was certainly not a high work of art, but it seemed to be loaded with valuable ornaments. Behind the canopy walked the civil governor (Count de Praya de Victoria), the military governor, and some of the high State functionaries, and the procession was closed by a column of monks. As the image approached, the people knelt everywhere within sight of it, and remained kneeling until it was past."

A favorite way of spending the hour of recess from work at noon is thus portrayed:

"Within the house, whither most of our party had retreated from the roasting sun, the first large entrance room was encumbered with the beautiful ripe ears of maize, of all colors, from the purest silvery white to deep orange and red. It was high noon, however, and a lot of bright-eyed girls, who had been husking the maize, had knocked off work; and on the arrival of the strangers a lad brought out a guitar, and they got up a dance, very simple and merry, and perfectly decorous."

The general appearance of the peasants of the Azores is described briefly as follows: "The men are generally good-looking, with spare, lithe, bronzed figures, dark eyes, and wide, laughing mouths, with fine white teeth. The women in the Azores are usually inferior to the men in appearance, but at this farm† some of the girls were very good-looking also, with clear complexions, and more of a Spanish than a Portuguese type."

Their dress is very peculiar. "The girls, as soon as they can afford it, purchase, if they have not already inherited, a long, full blue cloth cloak, coming down to the heels, and terminating in an enormous hood, which projects, when it is pulled forward, a foot at least before the face. The cloak and hood are thus a complete disguise, for if the lower part of the hood be held together by the hand—a very common attitude, while the eyes can be used with perfect freedom—both figure and face are entirely hidden. These cloaks and hoods are very heavy and close, and it seems strange that such a fashion can hold its ground where the conditions are very similar to those in the extreme south of Spain or Italy. The head-dress of the men is singular, but it has a more rational relation to the exigencies of the climate. It is also made of dark blue cloth, a round cap

* Ponta Delgada.

† In the house at which the dance, just alluded to, took place.

with a long projecting peak, and a deep curtain falling over the neck and shoulders, an excellent defense, whether from rain or sun. The odd thing about it is that where the hat is made in the extreme of a by-gone 'mode,' which still lingers in the remote parts of the island, the sides of the peak are carried up on each side of the head into long curved points, like horns. The horns are 'going out,' however, although a general festa,* such as we were fortunate enough to see, still brought many grotesque pairs of them into the city."

These strange forms of dress have, of course, been abandoned with their emigration, and the Californian Portuguese fishermen of the present day, whose places of settlement on the Pacific coast are here mentioned, resemble in appearance, so far as dress is concerned, the fishermen of any other nationality.

PORTUGUESE FISHERMEN AND WHALEMEN OF CALIFORNIA.—In San Diego County there is but one Portuguese fisherman, as is also the case in Los Angeles, the county immediately adjoining. In this county, at Portuguese Land, north of Wilmington, formerly existed a whaling fishery, but it was abandoned four or five years ago. The difficulty of obtaining fresh water was the chief cause of the removal of this company.

In Santa Barbara County the same number of Portuguese as recorded for San Diego and Los Angeles Counties is not exceeded.

In San Luis Obispo County there are forty-four Portuguese fishermen; one of these, at Port Harford, fishes at the mouth of San Luis Creek, using a seine of 1-inch mesh, 300 by 16 feet, now worth \$25, when new, \$75. He sends his fish twice a week, in wagons or by train, to San Luis Obispo, where he sells them at 6 cents per pound. The fish which are not shipped he salts and exchanges with the farmers for produce. In this way he exchanges about 100 pounds per week. The amount salted in summer is greater than that salted in the winter.

Three miles north of this point, on Pecho Rancho, there are two more Portuguese, who spend their time in fishing and hunting for abalones; and five miles still farther north are two more Portuguese fishermen. These last ship to San Luis market, salting what they do not ship.

In summer three of the whalers are engaged in fishing for the San Luis market, salting the surplus. They "still-fish" and troll in the San Luis Bay.

There are two companies of whalers in San Luis Obispo County—one at San Simeon, which is commanded by Captain Clark, and the other at Whalers' Point, about half a mile north of the landing at Port Harford, commanded by Captain Marshall.

The company at San Simeon consists of twenty men, all Portuguese but one, and most of them from the Azore Islands. They are hired by Captain Clark, who owns the entire outfit. This camp has existed for sixteen years past.

The camp located at Whaler's Point consists of twenty-one men, all but one of whom are Portuguese from the Azores. This company was established in 1868 or 1869.

The men at both camps are discharged in summer and a new set hired in the fall. Some of the men, when discharged, engage themselves in fishing for the San Luis market.

The outfits, &c., of these whaling companies are discussed in another section of this report.

In Monterey County there are forty-seven Portuguese fishermen, distributed as follows: At Monterey there are six, divided into two companies, between whom considerable rivalry exists. They use set-lines, and consequently catch little else but red rockfish. Some of these Portuguese have been there since about 1860, others having joined from time to time. They own five boats and three skiffs. They supply the hotels in Monterey and ship the rest to San Francisco. The

* The religious procession already described.

ruling price is 6 cents per pound. When the whaling season is over, the whalers join in the work of supplying the local markets.

There is one Portuguese at Moss Landing, Castroville. In this county are two whaling companies—one at Carmelo, consisting of seventeen men, all Portuguese, commanded by Captain Mariano. They have two boats, and during the past year took one finback, three humpback, and three gray whales. Last year this company was at Point Sur, farther south in Monterey County. During a great portion of the winter the sea runs so high that the men dare not go out.

The Monterey whaling company consists of twenty-three men, all Portuguese, and all but one from the Azores. Their commander is Captain Verissimo. This company has been in Monterey since 1855. They own three boats of New Bedford make, and during the past year they have taken fourteen whales and two basking sharks.

In San Mateo County there is one Portuguese, residing at Pescadero. He owns a gill-net which he sets at the mouth of Pescadero Creek, catching the salmon as they run up to spawn. He sells his fish in Pescadero, and finds the market so small that, although without family, he makes but a poor living.

In San Francisco there are twenty Portuguese engaged in the shore fisheries. Details of their habits and mode of living will be found in another paragraph below.

There are also thirteen Portuguese engaged in the San Francisco cod fleet, and forty more in the San Francisco off-shore whale fleet.

PORTUGUESE IN WASHINGTON TERRITORY AND OREGON.—In Washington Territory there are probably not more than three Portuguese, who, at Gig Harbor, are occupied in catching dogfish.

On the Columbia River, engaged in the salmon fishery, there are about one hundred Portuguese.

21. THE SPANISH FISHERMEN ON THE PACIFIC COAST.

SPANISH FISHERMEN IN CALIFORNIA.—There are now but few fishermen of Spanish descent in California, though occasionally they may be found among the mixed fishing population of the larger places.

“About one hundred years ago,” writes Jordan, “the various missions of California were founded. Later the country became the abode of Spanish *grandees*, who became the owners of large tracts of land, depending chiefly for subsistence on their herds of cattle, and paying but little attention to fishing. Their descendants and successors, the ‘Californians,’ men, for the most part, of mixed Spanish and Indian blood, fished and still fish only with hook and line. To the present day they compose the larger portion of those who sit on the wharves in the sun catching sculpins, but they own no boats and are not truly fishermen.”

There are at present not more than twenty Spaniards on the Pacific coast who can properly be termed fishermen. Four of this number are in Santa Cruz County, fifteen in San Francisco County, and one in Marin County.

The Spaniards of Santa Cruz County have in use two boats. They live in the southern part of Santa Cruz City, and fish for rockfish, sea bass, and barracuda. Little fishing is done by them or the Italian fishermen, their neighbors, in the winter on account of the rough seas which at that season must be encountered in the fisheries.

Of the Spaniards living in San Francisco City nothing can be stated as to their peculiarities of life. They live at the west end of Vallejo street, about the Vallejo street wharf, with fishermen of several other nationalities. They are employed in fishing with the drag-net.

At Smith's ranch, near the head of Drake's Bay, Marin County, is one Spaniard who, together with two Italians and one Austrian, is engaged in seine and gill-net fishing. The joint catch of these four fishermen will probably equal 50,000 pounds per annum. They send their fish every morning to Marshall's, from which place these men came to Drake's Bay, and whither they will return as soon as the fishing in Tomale's Bay improves. They catch chiefly "smelt."

22. THE GREEK FISHERMEN ON THE PACIFIC COAST.

There are in all fifty-five Greeks employed as fishermen on the Pacific coast of the United States.

Fifty of them live in San Francisco, where, with fishermen of many races, they fish with the drag-net.

At Seattle, Washington Territory, there is a company of three Greeks, who fish with seines along the shore, obtaining young salmon, flounders, &c., which are sold in a stall in the town. During the salmon season these Greeks go to the Columbia River to engage in the salmon fishery. The other two Greeks have settled at Port Madison, Washington Territory.

23. THE AUSTRIAN FISHERMEN ON THE PACIFIC COAST.

In Marin County, California, there is one Austrian engaged in fishing with one Spaniard and two Italians at the head of Drake's Bay.

There are eleven Austrians engaged in fishing in Washington Territory. Three are at New Tacoma. They either salt their fish or ship them fresh to Portland.

At Seattle there are five Austrians who fish with hook and line in the deeper waters of the bay, obtaining halibut, black bass, horse-mackerel, merluch, pollock, tomcod, &c. The remaining three fish at Port Madison, Washington Territory.

24. FRENCH FISHERMEN ON THE PACIFIC COAST.

In Los Angeles County, California, at Wilmington, there are 6 Frenchmen, who combine hook-and-line fishing with the gathering of abalones. They own two boats, the Wild Region and the Josephine, which average about three-fourths of a ton each.

In San Francisco County there are 15 Frenchmen. The remark made concerning the Portuguese in San Francisco will equally apply to the French fishermen of that city.

There are 2 or 3 Frenchmen employed in collecting frogs in Marin, San Mateo, and Kern Counties. These frogs they sell at from \$1.75 to \$4 per dozen.

In Washington Territory, at Port Madison, there is one Frenchman engaged in fishing. The principal fish sought at that point are perch and flounders, which are dried by the Chinese and Indians. Probably this French fisherman joins them in their work.

On the Columbia River, Oregon, engaged in the salmon fishery, there are 200 Frenchmen, and on the Sacramento and other salmon rivers there are about 50 more Frenchmen.

25. SOUTHERN EUROPEAN FISHERMEN OF SAN FRANCISCO.

A writer in the San Francisco Bulletin in May or June, 1875, thus described the European fishermen of that city:

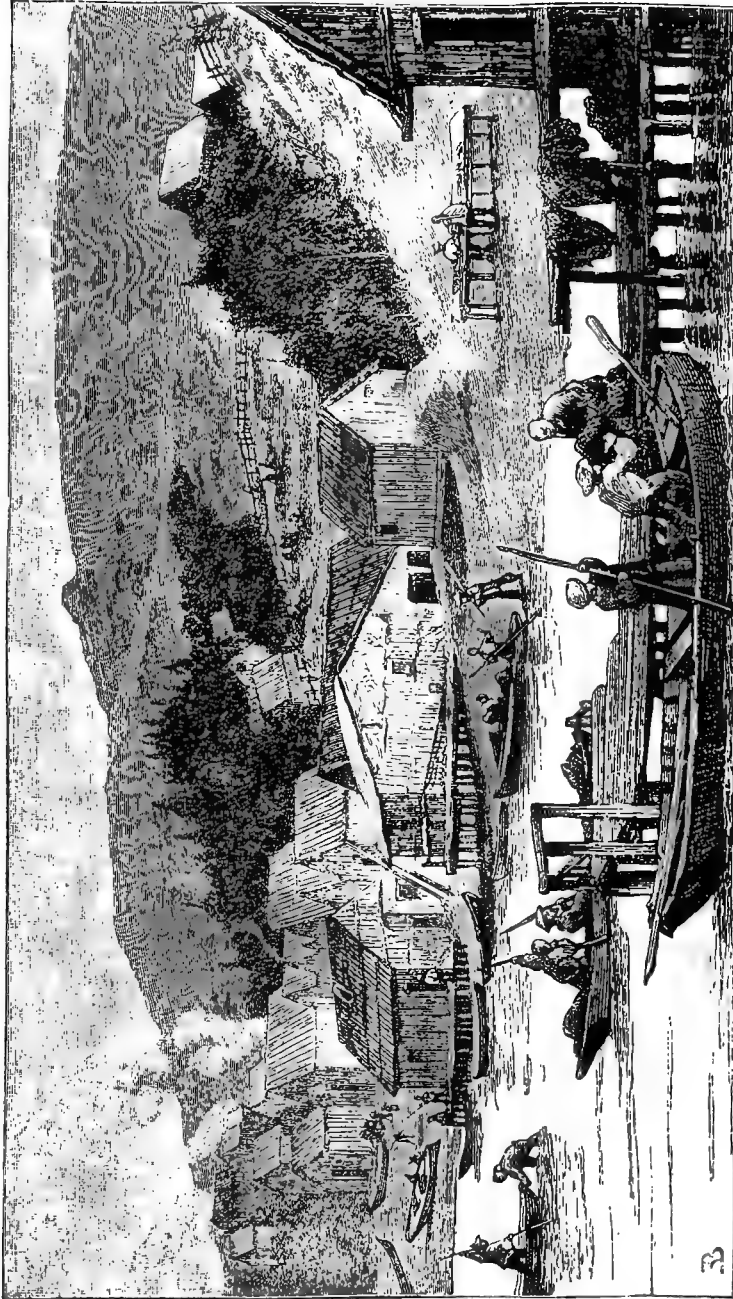
"Their dark faces and sanguinary shirts, their hoarse voices, and, above all, their picturesque lateen sails have a decided flavor in them of foreign waters. In fact, almost to a man, at some time

they have sailed or fished upon the Mediterranean. They are mostly Italians, but among them are Portuguese, Slavonians, Greeks, and Austrians. They all understand and can converse in Italian. Although many of them belong to benevolent societies pertaining to their different races, they are all bound together in what might be called the Fishermen's Union. It is a protective association. Each boat has certain rights and privileges not to be infringed upon by others. Each man contributes toward a common fund for the purpose of protecting the fishermen's interests, and to aid the families of deceased members. The association has regular attorneys, who are supposed to look after its interests. They have a place of meeting at No. 32 Clay street, called the Fishermen's House. Here is a cheap restaurant, where the single fishermen board, an indispensable bar, card tables, a billiard table, and a few beds. When anything unusual occurs among them they assemble here and hold a grand pow-wow.

"There are about two hundred boats and nearly 1,000 men engaged in the business. The great number of their boats now lie in a slip near the Front-street wharf, their old place at the foot of Clay street having been recently improved for a steamer landing. Each boat pays \$1 per week for wharfage. Their present quarters satisfies them very well now, but they are fearful that the winter northers sweeping in from the Golden Gate will destroy their boats. Their attorneys are endeavoring to have their quarters improved. Many of the fishermen are married and have families here, but the majority are single men, who intend some time to return to their native country, of course, rich. The married men live on Telegraph Hill, in houses perched like gulls' nests on the heights above the water. The houses, though small, are kept very neat. The fishermen's wives are usually bright-eyed, little Italian women, but some have become cosmopolitan in their tastes and taken to wife whatever offered itself. The boats, as a general thing, make one fishing trip per day, and the profits per boat are from \$10 to \$30, and even \$100 is sometimes realized from a single trip.

"About forty boats are engaged in fishing without the bay, and go as far as the Farallone Islands. These boats, of course, make longer trips, and the receipts per trip, if not the profits per day, are greater. The boats which fish in the bay use the seine almost exclusively, but outside it is used but little, the hook taking its place. The men are very reckless, and their lateen sails are often seen beating against a wind when our pleasure yachts are glad to find a harbor. It is not infrequently that one of these boats sails out early in the morning and never returns nor is heard from again. They are a very industrious people, and some of them are at work at all hours of the day and night. Some put out in the small hours of the morning and return at night; others put out in the evening and return when the sun is well up. Sundays they mend their nets and rig their boats. They are nearly all nominally Catholics, but their religion does not interfere with secular duties in the least. If you wish to see the whole set forget their English in an instant and appear as inscrutable as the sphinx, go among them as a missionary and inquire as to their spiritual condition. They make considerable money and live well. Macaroni, they find, is not an all-sufficient in this climate, and they take very kindly to pork and beef. As is usually the case with fishermen, they have a great contempt for fish and never eat it when anything better is to be had. They use a great deal of tobacco, chewing and smoking, and a great deal of liquor.

"They are the heaviest consumers of our California wines, although on extra occasions they indulge in imported articles. In spite of this liberal use of wine and whisky, one rarely sees a drunkard or a noisy man among them. Around the dock and upon the water they have a business-like air and say but little, but at the fishermen's house they appear very different. At the latter place they are noisy and merry and often drunk. Few of them, except the masters of the larger boats which cruise outside of the bay, are citizens. The boats are registered, and, according to



Chinese fishing village, California.

From a sketch in London Graphic, 1884.

our maritime laws, it is necessary that the masters should be naturalized when not native citizens. A few years ago, before owners of boats thought well enough of the country to adopt it as their own, rather than be naturalized they would hire some lazy Yankee or Irishman to cruise with them as 'master.' They paid as high as \$100 per month, and all that was required of the figure-head was to keep out of the way and furnish his own whisky. But times have changed. They have found that California is not such a bad place after all, and the supply of real masters is now equal to the demand."

26. THE CHINESE FISHERMEN OF THE PACIFIC COAST.

FROM NOTES BY DAVID S. JORDAN.

On the Pacific coast of the United States, and on the banks of rivers on which salmon canneries are established, there are about 4000 Chinamen engaged in catching fish, or in fish-drying and fish-canning. Of this number about 463 Chinamen are living in the maritime counties of California and Washington Territory, while the remainder are engaged in the salmon canneries, probably not less than 3000 being employed on the Columbia River, Oregon, and about 600 on the Sacramento and other salmon rivers.

SAN DIEGO COUNTY, CALIFORNIA.—In San Diego County, California, are thirty-seven Chinese. They settled there about the year 1870, and by the use of very fine-meshed seines have driven out the Italians who were there at the time of their advent. They are divided into eight companies, which are scattered along the coast between San Diego and Cerros Islands. At San Diego all the fishermen, excepting four Americans and their employés, are Chinamen. Upon their arrival they went to work at catching fish, which they salted and dried; these they shipped to China, their methods of fishing being probably the same as those now in use in China. They seek especially sheltered bays, which they sweep clean with their seines, usually commencing operations in the early part of the night. Some of the Chinamen live entirely on their boats, visiting their houses on land perhaps once a month. The upsetting of their junks* is a matter of frequent occurrence, the result usually being a reduction in the number of that particular colony to which the junk belonged. The Chinese take risks in stormy weather which no white man in this region would dream of taking. The two colonies here were established with a special view to fishing—one at Roseville in 1875, and the other in the town of San Diego about 1870. The latter consists of about a dozen houses, arranged in two rows, nearly at right angles to each other, while in close proximity are stagnant pools, stands for drying fish, outhouses and piles of rotten fish, and all manner of abominations full of crawling maggots, all of which tend to give the colony an extremely unsavory odor. The head man of the colony furnishes the greater part of the fishing capital, and the fishermen repay him out of the proceeds of their catches. The Chinese of these two colonies use seines, imported from China, about 300 by 10 feet, with a 1-inch mesh. When new these are worth about \$100. Along the coast of this county are gathered, principally by the Chinese, about 700 tons of abalones. North of Cerros Island the Chinamen have stripped the whole coast of this shell. Until lately the Mexican Government paid no attention to the depredations of the Chinamen, but now a license of \$60 for each boat is charged upon all coming from the United States in search of abalones, and to collect that tax a Mexican consulate has been established at San Diego. The origin of the abalone business was as follows: The Chinese in China dry the flesh of *Haliotis* (or some other related genus), and, finding that animal in California, they commenced the same industry there about the year 1873. Later, white men began to gather up the shells thrown away by the Chinamen, and the use of them for ornaments soon created a demand for them. Thereupon the China-

* This colony in 1881 owned four large junks, besides three smaller boats.

men saved the shells, and for three years or so the abalone-shell business has been very extensive. By the excessive working of this industry the abalones have been nearly exterminated in all accessible places, and American dealers now ship Chinamen to the neighboring islands difficult of access, receiving in return the shells, the Chinese retaining the meat.

LOS ANGELES AND VENTURA COUNTIES, CALIFORNIA.—In Los Angeles County are about 30 Chinamen, all of whom are engaged in collecting abalones. They ship to San Francisco annually about 150 tons of shells.

In Ventura County, at Point Magie, 9 miles south of Hueneme, is a colony of 6 Chinamen. They settled there in 1877. Two of this number were recently drowned by the upsetting of a junk.

At San Buenaventura there are a few Chinese engaged in fishing from the wharves.

SANTA BARBARA COUNTY, CALIFORNIA.—There are about 25 Chinamen in Santa Barbara County engaged in fishing. At Goleta there is a party of 3 employed in fishing with the seine. Many colonies of Chinamen are transported to the neighboring islands in the schooner *Surprise*, belonging to Rogers Brothers, for the purpose of collecting abalones, the meat from which they salt, dry, and ship to China, paying for their transportation to and from the islands with shells. On the Santa Cruz Islands as great a quantity as 50,000 pounds of fish have been caught in a season by Chinamen.

SAN LUIS OBISPO COUNTY, CALIFORNIA.—At Port Harford, San Luis Obispo County, there is a colony of 8 Chinamen, 6 men and 2 women, and at San Simeon and other places there are 50 Chinamen engaged in collecting abalones, the shells of which they ship to San Francisco, retaining the meat for shipment as food.

MONTEREY COUNTY, CALIFORNIA.—There are two extensive colonies in Monterey County, one at Pescadero, the other at Punta Alones. The colony at the former place, which is in the northwest corner of Carmelo Bay, was established in 1868, and is composed of 40 persons, living in eight houses. A considerable proportion of these are fishermen. The others attend to housework and to drying and preparing the fish. They use boats built by themselves, obtaining at Soquel anchovies for bait.

Spaniards, who never fish, are hired to cart the fish from the boats to the drying shores and, again, when dry and prepared, to the point of shipment.

The colony at Punta Alones, which is a mile and a half west of Monterey, settled there in 1864 and consists of 25 fishermen. This is a somewhat larger colony than the one at Pescadero. Some of the women here go fishing with the men. Others stay at home and dress the fish, which operation is aided by a heavy hatchet-like knife. One of the Chinamen at Punta Alones is an American citizen and speaks English well. Others have been hotel cooks. This colony compares favorably with any other on the coast. They ship daily to San Francisco, in fine weather, from 200 to 800 pounds of fish. The members of this colony, as well as those at Pescadero, dry and ship to China an unknown quantity of abalone meat and sell the shells. At certain seasons they also dry many tons of different devil-fish, squids, &c.

SANTA CRUZ COUNTY, CALIFORNIA.—Between Soquel and Aptos, Santa Cruz County, is a large colony of Chinese. There are about 50 of them, all men and all engaged in fishing. They ship to San Francisco and to San José direct, especially in summer. Those not so shipped are sent to Soquel, whence they are taken to San Francisco by steamer. The Soquel fishermen make great complaint of the violation of the fish laws by the Chinese, as the latter use fine-meshed seines and take large quantities of young flounders and shad, which are never returned to the water, the

Chinese caring nothing for the future fisheries. These fish are either salted and dried, or are left to spoil on the beach. The waste is said to be enormous.

SAN MATEO AND SAN FRANCISCO COUNTIES, CALIFORNIA.—In the town of San Mateo is a company of 7 Chinamen. They fish with seines and ship their fish to San Francisco or peddle them fresh in the neighborhood.

In San Francisco County the Chinese fishermen devote their attention to catching shrimp with purse-nets. With the shrimp small fish of other species are taken and afterwards salted and dried. At Bay View there is a Chinese colony consisting of about 24 men, who, with a hundred seines and eleven junks, are engaged in shrimping. There is another colony of 10 Chinamen 2 miles farther south. The Chinamen arrange the large shrimp, after removing the carapace, on two sticks of cane placed parallel to each other; these sticks passing through the flesh of the shrimp. These they sell for 30 cents per pound. Others are sold with the carapace and legs removed, simply as meats. The total catch of shrimp and prawn for this county is estimated at 30,000 pounds.

In former years the Chinamen in San Francisco County were accustomed to eat shark fins, both fresh and dried, which were by them esteemed a great delicacy. The entire business of shrimping was then in the hands of the Chinese. Their operations extended from Mare Island to Angel Island. The bulk of the shrimp caught by the Chinese with their fine-meshed nets was shipped to China in sacks. Large quantities of shrimp were sold also to oyster dealers in San Francisco who, after boiling them, would set them before their customers whilst waiting for oysters, thus to temporarily satisfy their appetites. The shells of the shrimp were shipped by Chinamen to China, who paid to the owners of their fishing-grounds a tax of from 50 cents to \$1 a month. They also used to catch sturgeon, from whose backbone they would pull with a hook the inside nerve; this, which resembles a piece of macaroni and is nearly 3 feet long, is dried and shipped to China as a rare tid-bit for the epicures.

In 1876 the Italian Fishermen's Union of San Francisco addressed a letter to one of the State Senators, the main object of which was to direct attention to the ruinous methods employed in fishing by the Chinese, their total disregard of the size of the fish they caught, and their waste of all the sturgeon they took, excepting the one nerve in the back above referred to. They fished so excessively that often they would ship to China as much as \$12,000 worth of shrimp and dried fish per month. The Italians, therefore, asked that the Chinese fishermen be compelled to adopt a system less destructive.

ALAMEDA COUNTY, CALIFORNIA.—In Alameda County there were established in 1870 Chinese fishing colonies which are now deserted. These fisheries were principally for the capture of smelt and herring from the wharf, which they carried on by the aid of very fine square nets, from which not even the very smallest minnows could escape. They would drop their net about every twenty minutes; when hauled up, a boat would be pushed out under the net, and the contents of the net dumped into the boat. Thousands were thus taken every day.

MARIN COUNTY, CALIFORNIA.—Near Point San Pedro, Marin County, there are two colonies of Chinese, numbering in all about 112 persons, who fish for shrimp. These they ship to San Francisco, after having dried them on the hill-sides and threshed them, in Chinese style, in order to separate the hull from the meat.

As will have been noticed, the peculiarity in the construction of the nets used by the Chinamen is that the meshes are extremely fine, the end in view being the capture of all fish, large and small, young and old; and many complaints have been made regarding their use of this style of net, especially by the fishermen at Soquel, Santa Cruz County.

AVARICE OF CHINESE FISHERMEN.—With a view to illustrate the extreme avarice of the Chinese fishermen, as shown by their exclusive use of very fine-meshed nets, it may be stated here that the Mexican Government has found it necessary to station a consul at San Diego who is instructed to charge every boat coming in search of abalones \$60 per annum, their depredations in this fishery having been so extensive as to almost exterminate the species.

SURF-FISHING.—The peculiar method of surf-fishing at Punta Alones and Pescadero in vogue amongst the Chinamen is one entirely unknown to American fishermen, and is described by Professor Jordan, as follows: "At Punta Alones and Pescadero the Chinese fishermen carry on a fishery for the capture of surf-fish [*Embiotoca lateralis*, *Damalichthys vacca*, &c.], and their methods, being characteristically oriental, are of much interest to a stranger. The gill-nets are placed among the kelp-covered rocks, not far from shore, and the boat goes around among the nets to frighten the fish into them. The old man plies the oar, sculling the boat. The young man stands in the bow, with a long pole, which he throws into the water at such an angle that it returns to him. The woman sits in the middle of the boat, with the baby strapped on her back. She is armed with two drum-sticks, with which she keeps up an infernal racket by hammering on the seat in front of her. This is supposed to frighten the fish so that they frantically plunge into the nets. Occasionally this is varied by the woman taking the oar and the old man the drum-sticks."

SHRIMP AND ABALONE FISHERIES.—The principal fishing industries engaged in by the Chinese are the capture and preparation of shrimps and abalones. The greater part of the shrimp are dried, threshed, and sent to market. The hulls are shipped to China and sold at \$20 a ton for manure. They are considered by the Chinese to be an excellent fertilizer.

A minor occupation of the Chinese is that of collecting seaweed.

A colony of Chinamen, numbering perhaps twenty-five men, is located at San Pablo, near the mouth of the Sacramento River, on the bay southwest of San Pablo. They are engaged in shrimp fishing, their methods being the same as those employed by the Chinamen about San Francisco.

FISHERMEN'S HOUSES.—The houses of the Chinese colony at Roseville, San Diego, number about ten. They are low, unpainted, dirty-looking buildings, and are surrounded by hen-coops, whose occupants are fed, to a great extent, upon the small fish which the Chinese capture in their fine-meshed seines.

CHARACTERISTICS OF CALIFORNIAN CHINESE.—It is noteworthy that the Chinese, perhaps in mistrust of their own race, never consign their fish to Chinese dealers in the cities, preferring to transact business with the Americans.

A writer in the San Francisco Weekly Bulletin of January 27, 1871, says of the Chinese fishermen of California:

"The Chinese fisherman in China is very different from the Chinese fisherman of California and far above him in equipments, habits, and scale of work. Confident of his seamanship and skill he dashes around in his lateen-sailed junk in a reckless manner, and in hours of recreation indulges his fondness for gambling, while the latter tugs painfully at the oar and finds his brother fishermen too poor to gamble with him. The Chinaman is a good sailor in his native craft, but in other vessels, when difficult duties are to be performed, needs some one to direct him constantly.

"On the southern bank, at the entrance of the San Antonio Creek, is a small Chinese settlement, consisting of some dozen wooden houses, called China Point. The shores of the creek are covered with smelt and herring, drying in the sun preparatory to being compressed into compact bales to be shipped away; the nets, patched and old, are lying around everywhere drying in the sun, and the whole is dirty, filthy, and ill-smelling.

"The fisherman's boat is a long, unwieldy, clumsily-constructed craft, with heavy, ill-shaped

oars. They are not shipped in double rowlocks after the American method, but work on a single pin which passes through the loom of the oar. With the nets piled up in the stern, and the crew at their places, the cockswain, using a large steering-oar, guides the boat to the long flats of the Oakland and Alameda shores, the principal fishing grounds, where the shoals of smelt and herring, which abound here at high water, are encircled by the nets. Stationary nets and seines are also used—one to lay all night, or for some hours, and the other for immediate and active work. At sunset, after drawing the nets, they row home and spread the catch on the shore, ready for the next day's drying. The journey home is accompanied by a song, if the catch has been a large one, or only a grunt, if poor.

"The shores of Islay Creek are the choice of the Chinese fishermen who live on the San Francisco side of the bay. Clams, smelt, and shrimp constitute their catch at low tide, and their manner of procuring the former is extremely remarkable. Either a long plank or ten square pieces of wood are placed under the feet, and using them in the same manner as snow-shoes the fisherman makes very fair time over the mud. His basket or light boat is pushed along to receive the shellfish as he picks them up, and before the tide has quit falling his shrimp-net does good service. Their cabins border on the creek, and have the same characteristics, though perhaps on a larger scale, as their fellows at the entrance to the San Antonio. But in addition to preparing fish for transportation to China, they supply, in a great measure, the market in the Chinese quarter, but their fishing ground has not the same size or quality of smelt that are found over the flats on the other side."*

CHINESE IN WASHINGTON TERRITORY.—In Washington Territory there are thirty-three Chinamen engaged in fishing. About Cape Flattery and Quartermaster's Harbor there are twelve; near Port Madison there are fifteen engaged in drying fish. They also buy from the Indians. Especial value is set upon flounders, but salmon are held by them in small esteem. At Port Gamble and Ludlow there are six Chinamen who occupy their time in fishing from the wharves. They catch a large quantity of dogfish.

CHINESE IN THE SALMON CANNERIES OF OREGON.—On the Columbia River, Oregon, as many as three thousand Chinamen are engaged in the salmon canneries.

After the salmon have been thrown into a heap on the wharf, the Chinamen cut off the heads, tails, and fins, and remove the viscera. Some Chinamen become so expert at this branch of the work that they can thus clean 1,700 fish per day. After the fish have been washed and cut into sections they are split into three pieces by the Chinamen, one piece being large enough to fill a can, the others smaller. These fragments are placed on tables, at which the Chinamen stand ready to pack them. Other Chinamen put on the covers, while yet others solder them, where this operation is not done by machinery.

The Chinese thus do the bulk of the work at the salmon canneries. The supervisors, foremen, and bookkeepers are, however, white men. The fish-cutters, if expert, receive from \$40 to \$45 per month. The majority receive \$1 per day of eleven hours, and work as required; that is, leaving

* WORSE THAN SEA-LIONS.—Our legislature has attempted to protect the salmon in our rivers by repealing the law protecting seals. It is asserted that the seals destroy the salmon which come down annually from the upper rivers to salt water. This may be true, but opinions are conflicting. However that may be, there is an enemy to the salmon far more dangerous than the round-eyed seal and that is the busy Chinaman. Only a few days since we watched the *modus operandi* of catching fish in our San Joaquin. Two Chinese junks, or schooners, appeared in the river, each holding an end of a remarkably fine net. The schooners then separate and sweep the waters with the net to the shore. Fish of all sizes are thus caught, and none, not the smallest salmon trout, are ever returned to the water. Those too small for market are thrown on the shore or fed to poultry. It is said by those familiar with the Chinaman's mode of fishing that these fine nets leave no young salmon behind, and are far greater enemies to their propagation than seals.—[Antioch Ledger, California, July 6, 1876.]

and coming at any hour that may be set, time during which they are actually at work alone being counted. No other race of people could work at such rates and upon such terms as these, and in the present state of things but for Chinese labor the canneries must needs be closed. They come in April and leave in August, and very few return. They are employed directly and without the aid of any agent. The Chinese, as a rule, work very faithfully. They are never engaged in any drunken riot, and their work is uniform. On the other hand, they are not devoted to their employers. If dissatisfied, "they are the hardest class in the world to manage." They would "use a knife for two cents." If their pay should exceed a day's indebtedness, they would very probably resort to foul, mean work. They are inveterate gamblers, and their wages, as earned, go from one to another to pay their gaming debts. A Chinaman dare not fish in the Columbia, it being an understood thing that he would die for his sport. They are only tolerated because they will work for such low wages. Each cannery employs from one hundred to two hundred Chinamen.

27. MISCELLANEOUS FISHERMEN OF THE PACIFIC COAST.

There are fifty Slavonians on the Pacific coast of the United States, employed as fishermen. They all live in San Francisco.

In Los Angeles County, California, there is one Chilian fisherman. In the same county one Irishman is engaged in fishing.

In Santa Cruz County, at Soquel, there are four German fishermen.

At New Tacoma, Washington Territory, there is one negro fisherman.

28. THE ARCTIC WHALEMEN OF SAN FRANCISCO.

Professor Jordan says, concerning the men on the Arctic whaling fleet, that the crews of all the vessels, whether owned East or on the Pacific coast, are made up in San Francisco. The officers are usually American, but there are very few American foremast hands. When an American ships before the mast, he seldom stays there long; he either gets aft or leaves disgusted. Portuguese, Scandinavians, and Germans form the bulk of the crew, and are all very hardy, and like the business. Now and then an Irishman is inveigled into the service by the boarding-house keepers; but Irishmen are never at home on a whaler.

29. THE FISHERMEN OF THE COLUMBIA RIVER.

There are upwards of 2,500 men engaged in salmon fishing on the Lower Columbia; about half of them in Astoria, the rest at the other cannery towns. A few of them, not one-tenth, live permanently in the towns where employed; the rest come from the interior, from San Francisco, and from the crews of various vessels along the coast. They come to the Columbia in April and leave in August, perhaps not half of them returning the next year. Some of them, especially Scandinavians, own small farms in the interior of Oregon and Washington. Many of the Italians and Greeks fish in San Francisco Bay when not upon the Columbia.

As to nationalities, exact information is unattainable. Looking over various lists of names and making inquiries indicate the preponderance of Scandinavians and Italians, with Greeks, French, Finns, Irish, and a few Americans. No Chinamen are employed in this fishery, though they work in the canneries. There are very few Indian fishermen on the Lower Columbia, none of them of pure blood.

About one-third of the men are married, and two-thirds of these, chiefly Scandinavians and

Finns, lead sober, industrious lives; the rest are, as a whole, a reckless and improvident set of men, spending their money as fast as earned upon drink and prostitutes. The proprietor of a "dive" in Astoria is said to have begun a short time since with nothing, and to be now worth \$30,000, his establishment being chiefly frequented by fishermen. Many have not enough left at the end of the season to pay their debts and to get away. Many of them, therefore, leave their debts unpaid.

Most of the men board in various establishments fitted up as fishermen's boarding-houses. These are of many grades, the usual rate being \$5 per week.

The few fishermen who can read peruse chiefly the Police Gazette and similar publications, the sale of which on the Pacific coast is far greater in proportion than on the Atlantic.

30. THE INDIAN FISHERMEN ON THE PACIFIC COAST.

There are at present no Indian fishermen employed on the coast of California, although certain tribes living inland, for instance the McCloud Indians, depend largely upon the fisheries for support.

Jordan has observed that in earlier times, before the settlement of California by white men, the Indians of the coast must have subsisted on fish to a very large extent. Spines of sharks and rays are found among the Indian remains on the Santa Barbara Islands, and some are thought to have been used for fish-hooks. Fish-bones are found in the refuse heaps of kitchen leavings on Santa Cruz Islands, where the inhabitants must have lived chiefly on fishes and mollusks. The Santa Barbara Islands give evidence of having been once densely populated. Scarcely anything eatable now grows above tide marks.

At the present time the Indian fishermen on the Pacific coast are all seated in Washington Territory and Oregon. There are about 380 of them scattered in groups throughout those regions. Two hundred Indians are employed in the Oregon salmon fishery.

At New Tacoma, Wash., are twenty Indians engaged in fishing for dog-fish, the oil of which is rendered chiefly in kettles.

At Steilacoom are about twenty Indians (Siwashes). They do not, to any extent, sell their fish, but reserve them for their own consumption.

Near Seattle are thirty Indians who fish chiefly for salmon-trout (*Salvelinus*), of which they bring boat-loads almost daily into the town.

Twenty Indian fishermen have been recorded from Port Madison.

In the northeast part of the sound, at Utsaladdy, are twenty Indians engaged in salmon and dog-fish fishing.

Ten Indian fishermen live at Muckilteo.

At Port Gamble are twenty Indians (Siwashes) engaged in fishing for dog-fish, and other small sharks. The oil is rendered by putting the livers into wooden troughs, into which hot stones are thrown; finally the oil is drained off.

Near New Dungeness, on the way toward Cape Flattery, are some ten Indians engaged in fishing for dog-fish.

At Neah Bay there is a considerable reservation of about twenty Indians, who are exclusively engaged in fishing and sealing.

31. THE MC'CLOUD RIVER INDIANS OF CALIFORNIA.

Concerning the McCloud River Indians, who are emphatically a race of fishermen, Mr. Livingston Stone, of the United States Fish Commission, writes as follows:

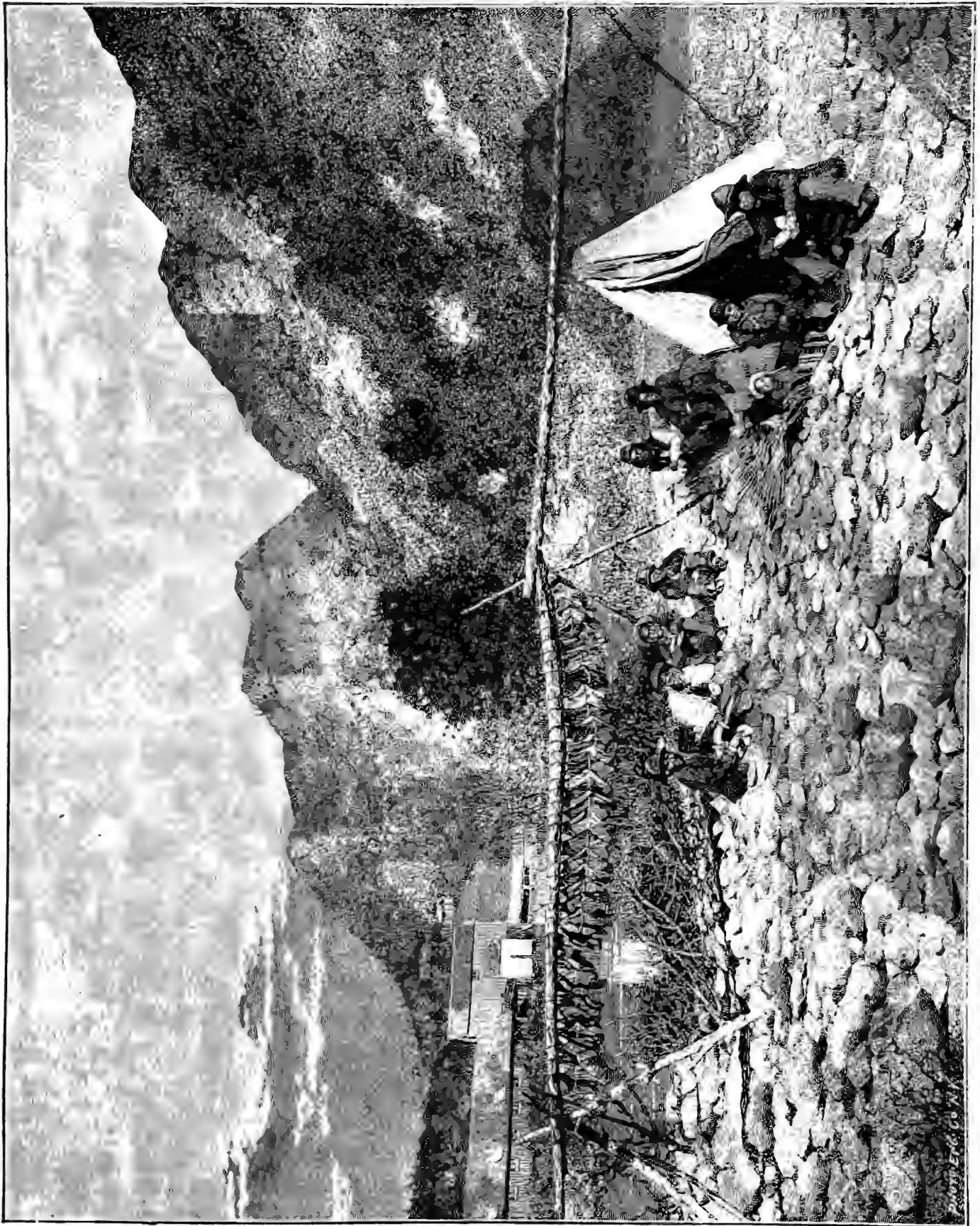
"The Indians themselves are a good-featured, hardy, but indolent race. I found them always

pleasant, genial, and sociable, though, like other Indians, very sensitive when their pride was wounded. They at first adopted the plan of ordering all white men out of their country, and were the last of the California Indians to yield to the encroachments of civilization. Even now they are not slow to say to the white stranger, 'These are my lands,' and 'These are my salmon'; but the stern consequences of conflict with the whites have taught them to abstain from any violent indication of their rights. They still always revenge a wrong inflicted on them by their own people, and deem it a duty to avenge the murder of one of their kindred, but I think they are a well-disposed race by nature, and have no malice naturally in their hearts toward any one, and will not injure any one who does not first injure them. Every one told me, before my arrival and during my stay on the McCloud, that the Indians would steal everything that they could lay their hands on. I am glad that this opportunity is afforded me of bearing testimony to the contrary, which I wish to do very emphatically. I would trust the McCloud Indians with anything. We used to leave our things every day around the house, and even down on the river-bank, for weeks together, where the Indians could have stolen them with perfect safety, and where they would not have remained ten minutes *in a white man's settlement*, and yet I do not know of a single instance of theft of the smallest thing on their part, during all our stay of two months among them. On the contrary, in one instance, an Indian traveled six miles one hot day to return me a watch-guard, which he found in the pocket of a garment which I sold him, and which he might have kept with perfect impunity. And on another occasion, on the arrival of some gold coin, when I had reason to expect an attack from *white men*, I gave the gold to one of my Indians, and told him that I depended on him to protect that and me till morning. I slept soundly, and the next morning the faithful Indian handed me the gold just as I gave it to him. I wish on these accounts to be very emphatic in saying that the charges against these Indians of being a race of thieves, are untrue and unjust.

"With all their good traits, however, murder did not seem to have the obnoxious character that it has among more enlightened people. Almost every McCloud Indian we met had killed one or more men, white or red, in the course of his life, but it was usually because they were goaded to it by ungovernable jealousy or revenge. It was not from motives of gain or causeless malice.

"The McCloud Indians live and sleep in the open air in the summer. In the rainy season they build wigwams or huts of driftwood and dry logs, which they inhabit pretty comfortably through the winter. In the summer and fall they live mainly on the salmon and trout which they spear. In the winter they live on the salmon which they catch and dry in the fall, and on acorns, which they gather in great quantities in the woods. They hunt with bows and arrows, with which they occasionally kill a bear, though a few of the more enterprising have rifles. They trap a very little, but the salmon of the river are so abundant that they are not obliged to resort to hunting and trapping at all, and do not do much of either.

"I have written this long account of the McCloud River Indians partly because their presence here is so singularly connected with the abundance of the salmon in the Sacramento River. Had white men come here, and required the salmon for food, this main artery of the supply system of the river would have been stopped; or had white men come and engaged in mining, as they have done on the Yuba and on the Feather and American Rivers, the spawning-beds would have been covered with mud and ruined, as in those rivers, and in less than three years the salmon supply of the Sacramento would have shown a vast decrease. The presence of the Indians, therefore, in so far as it implies the absence of the whites, is the great protection of the supply of the Sacramento salmon."



McCloud River Indians of California. Salmon drying on poles.
From a photograph by U. S. Fish Commission.

32. THE FISHERMEN OF THE GREAT LAKES.

FROM NOTES BY LUDWIG KUMLIEN.

NATIONALITIES.—Very many nationalities are represented among the fishermen of the Great Lakes, nor is the diversity of origin confined to the fishermen alone, for many of the owners and managers of the fisheries are of foreign birth. Next to the native Americans, Germans and Canadian-French predominate. The Scandinavian nations are also well represented. In some localities, particularly at the west end of Lake Superior and in the vicinity of Sault de Ste. Marie, the Straits of Mackinac, and Saginaw Bay, many pure and half-breed Indians are employed. At Sault de Ste. Marie, Indians are the principal fishermen. In the majority of the towns the nationalities are very much mixed. A catalogue would include Americans, English, French, Germans, Norwegians, Swedes, Russians, Poles, Belgians, Swiss, Dutch, Irish, and Indians. At the east end of Lake Ontario, however, all are either Americans or Canadian-French. In Green Bay the Swedes and Norwegians are said to be the most successful fishermen. With the Indians fishing is, of course, an hereditary profession, handed down from father to son. The western portion of the lake region has been so recently settled, and by so many different classes and nationalities, that it is highly probable that the fathers and grandfathers of the majority of the present fishermen were engaged in other occupations. On the west shore of Lake Michigan, however, especially between Porte des Mortes and Manitowoc, among the French-Canadians fishing is hereditary. The boys begin to assist while yet mere children, and naturally become expert boatmen and skillful fishermen. The fishermen at the east end of Lake Ontario, about Chaumont, Sackett's Harbor, and Henderson Bay, are said to have come originally from Connecticut, where they had been fishermen, and were the first to introduce pound and trap nets.

HEALTH.—As a class the fishermen are strong and robust, and well suited for their occupation. Fishing is considered a healthful pursuit in all respects, and, aside from the disasters caused by storms, conducive to longevity. Very many of the better class of fishermen are married, and in numerous instances favored with remarkably large families.

DISASTERS.—The sudden and violent storms which visit the lakes, particularly in fall, cause many serious disasters, resulting frequently in loss of life. The number of losses, however, is smaller than one would suppose at first thought, for it must be taken into consideration that the fishermen are expert seamen, and cautious withal, and that as a rule their boats are stanch and seaworthy. During the last decade only about seventy-five from all the lake towns have been drowned. The heaviest losses have occurred at Saint Joseph, near the head of Lake Michigan. On the 29th of April, 1875, eleven boats were fishing far from shore, a light wind blowing from the northeast. Suddenly it veered to the northwest, and a violent squall struck the fleet. Some of the boats were returning homeward with all canvas up, and were unable to drop their sails before the storm struck them. Four went down, carrying with them eleven fishermen. Few of the fleet reached shore in safety; some were driven upon the beach, many miles from their harbor, and nearly all sustained some injury, besides the loss of nets, and sails and other parts of apparatus and rigging. From 1869 to 1876 twenty-one lives were lost in all. These disasters, together with the scarcity of fish and low prices, have discouraged many fishermen in this locality, and they have left fishing to follow other occupations.

At Milwaukee as many as twenty fishermen have perished within 15 years. They were accustomed to visit fishing grounds distant from fifteen to forty miles from shore, in boats, frequently remaining two days and nights. The sudden storms oftentimes bewildered them, especially

when occurring in the darkness of night, and their boats were driven far out into the lake where they could not live, or were cast upon a dangerous shore.

Fishermen are sometimes drowned in winter while fishing on the ice, either through carelessness in approaching the holes which are made when setting and hauling nets, or in venturesome expeditions over ice too thin to bear their weight. One man perished thus near Bayfield, Lake Superior, in 1878, and another in 1879 at the Gull Islands, at the entrance of Green Bay.

FISHING VILLAGES.—As a large proportion of the fishermen live in villages and cities whose interest in the fisheries is of minor importance, they dwell in houses in nowise different from those of the same class of men engaged in other pursuits, partake of the same food and comport themselves in essentially the same manner. In some localities, however, fishing is the only important industry, and in these places it is possible to trace some peculiarities in the character and surroundings of the fishermen. Some such villages exist in Green Bay, particularly on the west shore, north of Cedar River. The fishermen dwelling here, as a rule, are well fitted for their occupation, temperate and industrious. The gains of many, however, for the past five years, have been hardly sufficient to support them, fish having been scarce and prices low. Their houses, which are barely comfortable, are always built near the fishery, close to the beach. A few have cleared fields of considerable extent around their dwellings, but the majority have tilled only sufficient land on which to raise potatoes and some other vegetables. A few miles north of Menominee the road terminates northward, and the only communication by land between the villages is by an imperfectly marked trail leading through an almost impenetrable pine forest. Communication with the outside world is carried on entirely by water. The Menominee dealers send boats along the shore every day during the height of the season and gather up such fresh fish as the fishermen may have for sale. They stop at every fishery and the fishermen bring out their fish in the pound boats. The fish are weighed and the dealers give receipts stating the number of pounds, the kind, and price, and at the next trip bring the requisite amount of money. At these times the fishermen send to town for whatever supplies they need, receiving them at the next visit of the dealers' boats.

At Green Bay City and the southern end of Green Bay generally, many fishermen are well-to-do and several in very good circumstances. Some others, as one might expect, on account of the variety of nationalities, are shiftless, and seem to have little tact in providing for their families. In many cases their gains are sufficiently large to enable them to live well if they but used judgment in expending them. Nearly all the fishermen are land-owners to some extent, several possessing valuable farms in addition to their fisheries.

At Two Rivers, situated on the west shore of Lake Michigan, on the Green Bay peninsula, the fishing population—nearly all French-Canadians—live in one locality at the mouth of the two rivers, forming quite a colony, known in the vicinity as "Canada." The men are apt to be extravagant during profitable seasons, taking little thought for the future. It has been stated that, as a class, the fishermen of this locality were formerly quite intemperate, but recently a decided improvement has taken place in this respect.

In the vicinity of the Straits of Mackinac the fishermen are of all grades, nationalities, and conditions. The least industrious, perhaps, are the French gill-netters. About two-thirds of them barely succeed in gaining a livelihood. They sometimes allow their nets to remain in the water for several weeks untouched, the fish caught in them becoming putrid. During seasons of plenty these, as well as some in other localities, are apt to indulge in extravagant living and comparative idleness, returning when their means are expended, to activity and humble living.

The fishermen of Huron are generally considered a better class of men than the Lake Erie

fishermen. The majority have entered the fishing business at a mature age and are less reckless and improvident and more energetic and hardworking than in some other localities. Fishing is not now prosecuted on Sunday as it formerly was in this vicinity.

CREDIT SYSTEM.—The system of credit, until recently in operation in many of the fishing towns, had a demoralizing effect among the fishermen and led to general financial disaster among the out-fitters. It was customary for the capitalists to furnish the fishermen with outfits and provisions on credit and take pay in the fish caught. This system encouraged the fishermen to contract large debts, and to live extravagantly, while they continually looked forward to the time when the capture of fabulous quantities of fish should relieve them of their indebtedness. The out-fitters, on the other hand, discovered in the course of time that the value of the fish caught was frequently less than that of the outfits they furnished, and while out of charity for the fishermen, who were dependent upon them, or for lack of the knowledge necessary to establish a better system, they continued to give unlimited credit, many became involved in financial difficulties which resulted in utter ruin. At present, however, except in a few localities, dealers will not take uncaught fish in security, and finances are in a better condition.

FINANCIAL PROFITS.—It is almost impossible to gather any information in regard to the financial profits of individual fishermen, except of those who receive salaries. In many localities fishing is thought to be becoming less and less profitable every year, while in others the profits are considered to be larger than formerly. The opinions expressed, however, are based so largely upon the success or failure of the individuals furnishing them, rather than upon an average of the profits of all the fisheries of any given locality, that they must be taken with allowance. Moreover, so few statements of the value of the lake fisheries have been published in past years that there is nothing with which to compare the figures obtained for the present report. It must be the work of the next census to make such comparisons and to determine whether the lake fisheries are increasing or decreasing in importance and profitableness. More in regard to this subject will be found in the section of this report which treats of the methods of the fisheries.

B.—THE SAILOR FISHERMEN OF NEW ENGLAND.

33. SHORE EDUCATION.

SCHOOLS AND CHURCHES.—In the early days of the Massachusetts colonies the coast fishery was one of the most important industries upon which the people relied for support. In the early records of the Plymouth colony and, later, in the various town records may be found ordinances for the establishment of free schools, the teachers of which were to be supported by appropriations from the proceeds of certain public fishery privileges, and similar provisions were made for the maintenance of "an able, godly minister," an agent of equal importance in the educational system of the colonists.

The following order is on record:

"Whereas, at the General Court of His Majesty holden at New Plymouth, in June, 1670, the court, upon due and serious consideration, did freely give and grant all such profits as might or should annually accrue to the colony, from time to time, for fishing with nets or seines at Cape Cod for mackerel, bass, or herrings, * * * to be improved for and toward a free school in some town."

The records of the Plymouth colony show that in July, 1677, the Cape Cod fishery was let for seven years, at £30 per annum, to certain individuals who are named, to seine mackerel and bass. They were restricted to take in the Plymouth colonists with them; and if none offer to admit strangers, and a portion of the profits of the hire which accrued to the colony were distributed to the schools.

For the maintenance of a minister:

"The first Court of Assistants, holden att Charlestown, August 23, 1630, Ordered, that Mr Phillips [a minister] should have allowed him 3 hogsheads of meale, 1 hogshead of malte, 4 bushells of Indean corne, 1 bushell of oatemeale, halfe an hundred of salte fishe; for apparell, and other provisions, £20, or els to have £40 given him in money per annum to make his owne provisions if hee chuse it the rather, the yeare to begin the first of September nexte."*

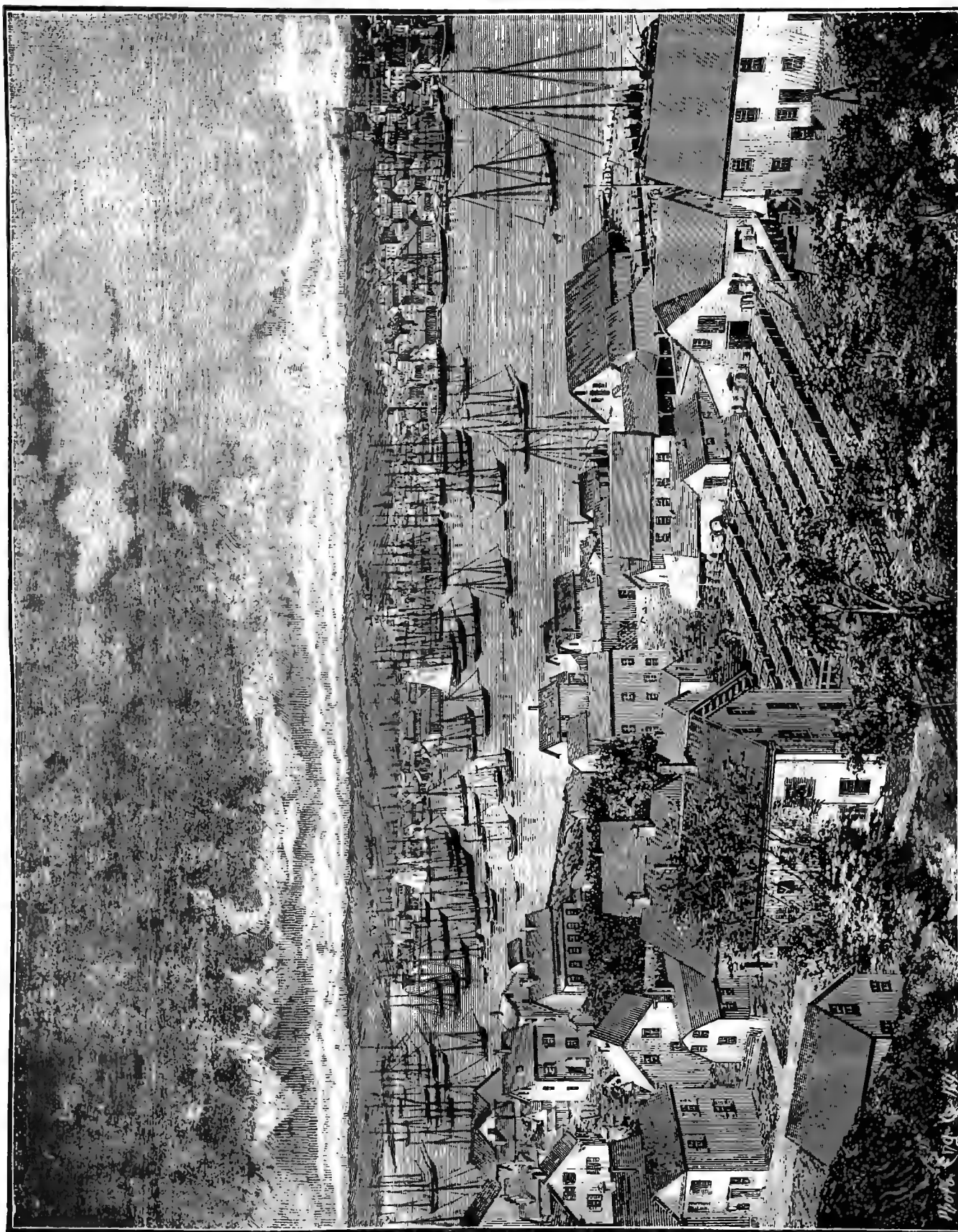
In 1662 for the support of a minister in the Plymouth colony the following order was—

"Made and concluded by the Generall Court held att Plymouth for the Jurisdiction of New Plymouth the third of June Ann^o 1662. The Court proposeth it as a thing they Judge would bee very comendable and beneficiall to the Townes where God's Providence shall cast any whales; if they should agree to sett apart some part of every such fish or oyle for the Incorragement of an able Godly Minnester amongst them."†

From that time until now the New England coast towns, like those of the interior, have as a rule been well provided with free schools. These are attended by the boys until they are old enough to go to sea and by the girls until they are sixteen or seventeen years old, and sometimes still longer. It is quite usual for boys to engage in fishing in summer and to attend school in winter, and some do this until they arrive at the age of manhood. As a class the girls are almost always better educated than the boys, and the intelligence and refinement among the women along the coast, some of whom are always school teachers, seems to a stranger very noteworthy. The excellent education of the wives and mothers of the fishermen cannot be without a very important effect. The people of most of the fishing villages from the Bay of Fundy to New York are intel-

* Records of Massachusetts, vol. i [1628-1641], p. 73.

† Plymouth Colony Records, vol. xi, 1623-1682, Laws, p. 135.



Gloucester, Mass. ; view looking west from East Gloucester.

From a photograph by T. W. Swillie.

Martha E. G. 1898

ligent and refined to a noticeable degree, and in many instances to a greater degree than those of the average agricultural and manufacturing communities of the interior.

PUBLIC LIBRARIES AND LYCEUMS.—In many of these villages libraries and reading-rooms are sustained throughout the year. Courses of lyceum lectures are kept up and well attended in the winter.

In some villages, such, for instance, as Provincetown, literary societies are kept up in the winter, and readings, essays, and lectures by members provide entertainment for the weekly meetings. In Provincetown several lectures on the fisheries have been given by one of the old fishermen of the place. Through the influence of the pastors of the churches, "sociables" are often held in connection with the church, a large part of the evening's entertainment consisting of reading and music furnished by members of the church community. The intellectual grade of the fishing towns of Massachusetts and Maine may be judged from the fact that the churches of these towns are able to secure and keep in their service clergymen of fine education. In Maine and Massachusetts the Methodist Church is one of the most popular, and the appointments in the principal fishing communities are deemed to be among the best in the conferences within whose limits these towns are embraced.

We have spoken thus far of the smaller towns and fishing villages. In cities like Gloucester and New Bedford, which are supported chiefly by the fishing interests, there is a large proportion of the population which, though in a certain sense dependent on the fisheries, can hardly be considered as belonging to the sea-faring classes. In these communities the opportunities for intellectual culture are more extensive than in smaller places.

Nantucket is still to be regarded as a fishing town, although its interest in the fisheries is entirely retrospective. The intelligence of the inhabitants of this and other whaling ports is too well known to require mention.

We have spoken of the atmosphere of intellect and culture in the average fishing towns in order that the home influences of the young fishermen may be properly understood.

FOREIGN FISHERMEN.—The fishermen who come to the United States from certain towns in Nova Scotia are noted for their intelligence, while those from other localities, Judique, for instance, are equally noteworthy for their ignorance and brutality. Among the better towns of Nova Scotia may be mentioned Yarmouth and Pubnico, and many other ports on the southern coast of the Nova Scotian peninsula. Yarmouth is well known to be a town of intelligence and enterprise, and has, in proportion to its size, perhaps the largest fleet of square-rigged vessels in North America.

The schools of Nova Scotia, especially those of the southern portion, are said to be excellent, comparing favorably with those of New England.

Certain districts on the island of Cape Breton have a reputation very different from that of Nova Scotia, and the fishermen from these districts, especially in past years, have had a very bad name in the fishing fleet. The fishermen of Newfoundland are remarkable for their lack of intelligence and gentleness. This is largely due to the fact that on the coast of this island the fishermen do not gather together in communities to any great extent. Their houses are scattered here and there along the coast, singly or in small clusters, and it is impossible for the people, with the best of intentions, to provide educational facilities for their children.

We have referred to the education and the home influences of the Provincial fishermen because so large a number of Gloucester vessels are manned by them. Until within thirty years the fishing population of Gloucester was almost entirely native born, and the remarks which have already been made regarding the other towns on the New England coast would apply with equal force to Cape Ann. At present the large foreign element there must be taken into account in esti-

mating the intellectual and moral condition of this city. The influence of the Gloucester educational institutions is, however, soon felt by the foreigners who settle there.

FISHERMEN'S CHILDREN.—The children of the foreign-born fishermen sailing from Gloucester, as well as those whose parents are natives of New England, have profited much by the excellent system of schools which is as marked a feature of this port as of any other city of its size in Massachusetts. It is a common occurrence to see children of fishermen—both of foreign and native-born parents—carrying off the honors at the schools, and a few years later occupying responsible positions. As a matter of fact, some of the most competent teachers in the Gloucester schools—if not, indeed, a majority of them—are the daughters of fishermen, nor is this specially surprising in a city which has often been represented in the Massachusetts legislature by men who had formerly been fishermen, while its city government, mayor included, has been largely drawn from this class.

HIGHER EDUCATION.—Thus it will be seen that while the majority of New England fishermen generally acquire only education sufficient to enable them to pursue their vocation, there are, nevertheless, a considerable number who, profiting by the opportunities of going to school in winter, acquire sufficient knowledge of books to enable them in after years not only to take command of fishing vessels, but to enter into fields of labor, and to accept responsibilities which require no ordinary amount of intelligence and judgment. It is by no means uncommon to find fishermen who have a remarkable store of general knowledge, and some who have come under our personal observation could quote at length from many of the poets, history, and the Scriptures. In more than one instance that might be mentioned, fishermen have shown considerable taste for art. This usually exhibits itself in making various kinds of scrimshaw work, such as miniature vessels and carving on wood or bone. In rarer instances they learn to paint or draw and sometimes produce very creditable work.

Many of the songs and ballads published in the local papers of the fishing towns, and in a collection of such, called "The Fishermen's Song Book," printed in Gloucester, have been written by fishermen.

34. SEA EDUCATION.

TRAINING OF THE YOUTH FOR FISHERMEN.—The young fisherman enters upon his career with a store of hereditary and acquired attainments which render it possible for him soon to become an excellent mariner. Along the coast of Maine, where the old methods of fishing are still practiced by the boat fishermen, small boys are taken out to help their fathers and brothers as soon as they are old enough to be of practical assistance. It is not uncommon to see boys of eight or nine handling fish almost as large as themselves. On the cod and halibut vessels, and upon mackerel vessels which use the purse seine, boys are of little use until they are large enough to do a man's work; consequently, at the present time they are rarely shipped until fifteen or sixteen. This change has many advantages, yet there can be no doubt that its effect is derogatory to the general grade of intelligence among the fishermen. Boys, who at the age of ten would be willing to ship on a fishing vessel, when five or six years older have obtained a fair education, and the taste for some occupation on shore has created a dislike in their minds to the life of fishermen, whom they consider to be their inferiors in ability and education; consequently, they do not become fishermen, and, though they make useful members of the shore community, the fishing class loses. These remarks apply particularly to large ports like Gloucester and Provincetown, where, at present, it is rather unusual for the son of an intelligent fisherman to be a fisherman himself, though, until within the last twenty or thirty years, the occupation of fishing had been for several

generations hereditary in their families. The fishermen of these ports who are not foreigners, are, for the most part, drawn from the coast of Maine and the smaller ports of Cape Cod and Southern Massachusetts, where the old customs are still somewhat prevalent. The fact that the sons of well-to-do fishermen do not follow in the footsteps of their fathers is in part due to the fact that the fisheries of the United States are now much less profitable than they formerly were, the existing treaty with Great Britain having recently given an unfair advantage to the fisheries of British North American Provinces.

The youngster sailing upon a fishing vessel—whether he be ten or sixteen years of age—enters on a course of practical training under the direction of the skipper and his shipmates. If intelligent, ambitious, and industrious, he, in two or three years, thoroughly understands how to fish and how to manage a schooner, and what is more, he has learned to perform such duties as are within the limits of his strength by pure force of habit. He has acquired many of those points of skill which become more and more a second nature with him as he grows older, being able to lay his hand on any rope in the dark, to steer a vessel at night by the feeling of the wind on his face, to ease a vessel in a seaway by an involuntary movement of the hand as it rests upon the helm, to safely enter various harbors, either at night or day, and to know by instinct just what sails to change with varying circumstances. He has learned to distinguish between the different species of fish that he habitually sees, by peculiarities of their motion as they swim around the vessel at night, leaving shining tracks of fire behind them in the water, and to determine the presence of fish by the movements of the vessels in the offing, by the action of flocks of birds, or by the different sounds which some species of fish make as they flip with their fins at the surface. He knows how to dress mackerel, cod, or halibut, in darkness, guided by the sense of feeling. These feats of skill, which are soon learned by the observant and easily impressed mind of the younger boy, require a much longer time for acquisition by a boy of fifteen or sixteen, whose powers of observation, as well as his interest in such matters, have doubtless been dulled by his training on shore, however much his reflective powers may have been improved. An experienced skipper states from his own knowledge that boys who have gone with him at the age of fourteen or sixteen cannot usually be trusted to take their place at the helm or on the watch until they are eighteen or nineteen, but that those boys who went at the age of ten years can generally perform the duties of the watch when fifteen, and in some cases as young as thirteen. Many boys, trained in the old manner, have become skippers of vessels when from seventeen to nineteen years of age. Some of the most successful “fitters” at Gloucester had command while still in their teens.

These men have generally acquired a fair education by their own efforts, and in strength of character, ability, and general intelligence they are to-day by far the best men in the fishing fleet. These are the men who have been trained from early boyhood to face danger and hardship, and to meet and overcome emergencies, and exhibit traits of quickness, bravery, and presence of mind. It may, indeed, be stated as a fact that a fisherman never attains to the highest excellence in his profession who has not been accustomed to a sea-faring life from early boyhood.

TRAINING IN NAVIGATION.—A boy is trained in navigation precisely as in the management of the vessel and in the methods of the fisheries. He first learns to steer, perhaps by a landmark, then he learns the compass, and, later, how to shape the course or to measure distance on a chart, by observing the actions of the skipper. In this way he also learns to take the bearings of the land and to estimate its distance. The skipper often gives instruction to those of his crew who desire it in taking observations and calculating latitude and longitude. In former days it was an accomplishment which every ambitious boy was anxious to learn to be able to estimate the velocity of

the vessel by observing her motion through the water. The old-fashioned log was seldom carried on the fishing vessel, though at present the patent log is in general use.

Another important accomplishment which is sooner or later acquired by the young man who is anxious to be a skipper is to become familiar with the shape and character of the bottom on the fishing-grounds and along the approaches to the ports which he frequents. This is learned by sounding and thus ascertaining the depth of water and the nature of the bottom, and again by a study of the charts. All of these branches of navigation a smart boy learns long before he is of age, and, as a rule, they are acquired on board of the vessel as opportunity offers from day to day. In some of the larger ports, such as Provincetown, there are, in winter, schools of navigation which offer opportunities to study this science. These schools are usually well attended; but, of course, lessons there given are of little value unless they are practically applied on shipboard in the summer.

Besides the skipper who instructs his crew in navigation, there are frequently experienced navigators among the crew who become the instructors of their younger associates. Such instruction is always given as a matter of good fellowship and without remuneration. The fishermen of New England, as a class, are acknowledged to be excellent navigators, and from the fishing communities have been drawn thousands of masters of merchant and coasting vessels in all parts of the United States.

During the late war between the States, fishermen were, in some instances, employed in the Navy as sailing-masters, this position requiring the highest grade of seamanship and skill in navigation. Some of them rose to still higher positions. From their intimate knowledge of the coast-line fishermen are recognized to be the best local pilots, and they are often called upon to act in that capacity by vessels unable to procure regular pilots.

Although the results of the present system have been in the main satisfactory, it cannot be denied that there are many masters of fishing vessels who are shamefully deficient in their knowledge of navigation, and who are unable to ascertain their position at sea with even a fair degree of accuracy or to shape their course with a definite knowledge of where they will strike the coast. There are instances of vessels bound for Gloucester from the Banks or Bay of St. Lawrence making land south as far as Montauk Point or the mouth of the Chesapeake.

The schools of navigation should be more generally encouraged and supported. A system of examining and licensing the masters of fishing vessels would be of great importance. There is no reason why this should not be insisted upon in the fishing fleet as well as in the case of the merchant marine, for the fishing schooner carries a larger crew in proportion to its size, and is generally a more valuable piece of property.

TRAINING OF CAPE COD FISHERMEN.—Freeman, in his history of Cape Cod, thus speaks of the training of the young fishermen of that district:

“Whales, that formerly were so common on this coast, must now, if sought, be looked for in distant waters. The other fisheries are prosecuted with success; and the merchant service has from the first been indebted to Truro for some of its most able ship-masters. The youth of the place are often scarcely of age when they rise to the command of a vessel. It has been remarked that though the youth and strength of a place be employed two-thirds of the year in obtaining, by hardy and audacious toil, the wealth of the seas beyond the line, and even on the further side of Cape Horn; and, though early habits and the love of voyages occasionally prosperous induce the employment, the business is often precarious. Great dangers, and hardships, too, are often encountered; but they who survive them are generally successful in acquiring good estates. We must here be indulged in quoting from the English traveler of 1807 his relation of an incident that

illustrates the enterprise of early youth. He says: 'In passing from Truro to Provincetown,' by the bay route, 'I had in company an inhabitant of the latter place. As we approached the mouth of the inlet, the vertebrae of a small species of whale, here called the blackfish, became frequent on the beach, together with other signs of the fisheries. Soon after, at the distance of half a mile, on the sandy flat from which the sea was now fast retiring, we discovered a boy, and near him appeared to be a great fish. The solitariness of the boy and his smallness compared with the fish, formed a combination sufficiently remarkable to draw us to the spot; and we found our fisherman of about ten years of age astride a porpoise about 10 feet long, in the midst of a sea of blood collected in the hollow of the sand. Alone, with a common table-knife for his instrument, he was cutting the blubber from the ribs of the monster, a task which he performed in a very workmanlike manner. Upon inquiring, we learned that he alone had killed the fish. His employment in the morning had been the tending of his mother's cows; and from the hills on which he was he had seen a shoal of porpoises enter the inlet. As the tide was ebbing, and the shore flat, many of them were soon embarrassed by the want of sufficient water to move in; and he flattered himself that by leaving the cows and coming down to the beach, he might be able to make a prize! So going into the water as far as he dared, he selected one struggling to regain deep water. This fish he boldly caught, from time to time, by the tail, thereby increasing its difficulties, till at last the water running away left the porpoise upon the sand. He staid by the fish till he was sure that escape was impossible; and then running home, a distance of a mile, procured a knife. Thus armed, he proceeded to wound and kill the fish—a task of some labor and danger; and, according to his account, he had accomplished it only by watching opportunities—alternately striking and retreating. My companion said it would yield 10 gallons of oil, and give the little cowherd \$10 for his exploit.'

"Of even children, on the lower parts of the Cape, the little porpoise-killer at Truro is a fair specimen. Boys are often at sea at a very early age. Many of them at ten have become expert fishermen; and all who have a mind for promotion find their way from the fore-castle to the cabin in due time. Many of our best commanders in foreign voyages are furnished here. The testimony of Burke, in the House of Commons, before the Revolution, 1774, in regard to the mariners of New England, was especially applicable to this and other parts of Cape Cod. 'No sea but what is vexed by their fisheries; no climate that is not witness to their toils. Neither the perseverance of Holland nor the activity of France nor the dexterous and firm sagacity of English enterprise, ever carried this most perilous mode of hardy industry to the extent to which it has been pursued by this recent people. * * * A more hardy or enterprising race of mariners is nowhere to be met on the watery element.'"

35. MENTAL AND PHYSICAL TRAITS.

CHARACTERISTICS OF AMERICAN FISHERMEN.—It has been the custom of many writers upon the fisheries to consider the fishermen as a peculiar class of men, with striking mental characteristics by which they could be distinguished from the population of the shore. This may be justifiable in cases where the profession of fishing is hereditary, in which event those who pursue it are prevented by social limitations from entering upon commercial or other pursuits upon land. It has been quite a common practice to consider the fishermen of all countries as possessed of similar traits.

In Sabine's well-known report on the American fisheries he devotes a chapter to the public services and character of fishermen,* in which he gives many interesting facts concerning the serv-

* Report on the Principal Fisheries on the American Seas, pp. 198-210.

ices of the fishermen of New England in time of war. At its conclusion, however, he falls into the vein of thought alluded to, and brings instances from the pages of history to prove that the fisherman is of necessity a grateful man, a patriotic man, a benevolent man—his proof of this, perhaps, being derived from an adventure of Mungo Park in one of the fishing villages of Africa—a sympathetic man, a law-abiding man, and a man who is loyal to duty. He illustrates the latter point by reference to the fishermen of Galilee, and incidentally eulogizes the fisherman's wife by quoting instances where fish-women in France, England, and Italy have performed charitable deeds, or, standing upon the sea-shore as evening approaches, chant melodies and listen until they hear answers from their husbands, who are guided by the sounds from their own villages.

A study of the fishermen of North America forces one to the conclusion that the fishermen are in all respects very similar to their neighbors on shore in the region in which they were born and educated. The crews of the cod and mackerel schooners of Massachusetts and Maine, when once they set their feet upon the shore, cannot be distinguished from their brothers and cousins who are clerks in the shops and mechanics in their native villages. The ignorant and lawless natives of certain parts of the British Provinces may be precisely matched among the agriculturists of the same district, while the enterprising and skillful Provincials, who are in command of a large number of vessels in the American fleet, are very little different from the better class of farmers and shop keepers of their old homes. The negroes, by whose strength the shad fisheries of the Southern rivers are carried on, are not to be distinguished from other negroes of the same district; in fact, except during the limited season of the fisheries, they are engaged in the same pursuits as their neighbors. The Portuguese fishermen retain the prejudices and habits of their native Azores. The Mediterranean fishermen, of whom so many are to be found on our Southern and Western coasts, might be transplanted with their boats to the coasts of Calabria, Greece, or the Balearic Islands, and would there be at home. The Irishmen of Boston, with their sloop-cutters and primitive fishing-tackle, are west-coast Irishmen still. All retain the peculiar mental characteristics of the districts in which they were trained, though all are more or less broadened and developed by the greater freedom which they find in the United States. A large percentage, probably more than a half, of the number of those enumerated in this report as fishermen are actually engaged in the fisheries only a few months in the year, and at other times are occupied in farming or any other pursuits on shore.

We refer here not to the crews of the fishing vessels belonging in the larger ports, but to many of the fishermen on the coast of Maine, and to almost all of those from Cape Cod southward, except the Connecticut fishermen, who supply the markets of New York and Havana, a few men engaged in the market fisheries of the large Southern States, the oyster fishermen of the Chesapeake, and the sponge and oyster fishermen of the Gulf of Mexico, and the men who fish habitually for the San Francisco market.

The fishermen of New England are of special importance and interest, since they correspond more closely to the professional fishermen of Northern Europe and constitute the class usually thought of when the fishermen of the United States are spoken of. For them especially treaties are made, tariffs are imposed, and from their ranks the merchant marine is recruited.

FISHERMEN AS CAPITALISTS AND MERCHANTS.—The ease with which the New England fisherman, accustomed to the constant sea-faring life, adapts himself to changing circumstances, may be judged from the fact that many so often abandon fishing and enter successfully upon other pursuits. Most of the fishery capitalists of Gloucester and other fishing ports are men who have been trained as fishermen. This is also the case with the fitters of the whaling fleet in Southern New England. In many ports these men carry on, in connection with their fishing business, a general

mercantile business. In Provincetown, for instance, all the principal shops are located upon the wharves, and are carried on by the fishery capitalists. The banks and insurance companies in the fishing ports usually have many retired fishermen upon the board of directors and other officers. Thousands of men from different parts of the coast have abandoned the fishing interest entirely, and have been successful in farming, in business, and in many other branches of industry. It has already been mentioned that a very large number of merchant vessels are officered by fishermen. Many fishermen have entered the Christian ministry and have been successful. Mr. John J. Watson, a well-known musician of New York City, who has met with considerable success upon the concert stage, began his career as a fisherman on a Gloucester schooner at the age of eight years, and continued fishing until after he had reached manhood.*

PATRIOTISM.—During the late war several companies of infantry were organized at Gloucester, composed largely of fishermen, and their record was excellent. Instances of this sort might be given by the page.

PECULIARITIES.—The fisherman rarely acquires any peculiarities of carriage or address by which he can be distinguished from his neighbors on shore. When he has left his vessel and assumed his "shore togs" no one would suspect him of being a sea-faring man. We speak here of the better men, whom we choose to regard as representatives of the class. Of course there are among fishermen many men who have the manners and appearance of common laborers, and who never change their costume or mingle with men engaged in other pursuits. These are commonly men of foreign birth, whose peculiarities are those of their native country rather than those appertaining to their profession.

A certain class of fishermen, however, must be excepted from these remarks. We refer to those men who are engaged in the shore fishery from little boats, and who spend their lives in solitude, fishing among the ledges near their homes. These men are seldom brought into contact with the world, and acquire peculiar mental traits, and in the course of dozens of years of solitude develop a bearing and physiognomy which mark them unmistakably as men of a peculiar class. These men are usually to be found upon isolated parts of the coast, such as the Isles of Shoals, Block Island, No Man's Land, and isolated islands on the coast of Maine.

Celia Thaxter, in her charming little monograph of the Isles of Shoals, thus speaks of the carriage of the fishermen: "Most of the men are more or less round-shouldered, and seldom upright with head erect and shoulders thrown back. They stoop so much over the fish-tables—cleaning, splitting, salting, packing—that they acquire a permanent habit of stooping."

These same peculiarities of bearing were also noticeable among the Bank cod fishermen of the olden time, who were accustomed to fish over the rail of the vessel, and were consequently, for a large part of the time, in a stooping position. The introduction of trawling has had the opposite tendency. The hauling of the trawls and the constant exercise in rowing the boats to and from the vessel has a tendency to expand the chest and throw the shoulders back, so that the fishermen are now upright, broad-chested looking men. The crews of the whaling vessels are also marked examples of a fine physique and good muscular development.

The following paragraph from the book just quoted from describes very picturesquely the conditions and circumstances of the life of a boat fisherman of the olden time:

"Till Bennaye grew very feeble, every summer night he paddled abroad in his dory to fish for hake, and lonely he looked, tossing among the waves, when our boat bore down and passed him with a hail which he faintly returned as we plunged lightly through the track of the moonlight, young and happy, rejoicing in the beauty of the night, while poor Bennaye only counted his gains

* Fisherman's Memorial and Record Book, pp. 149-153.

in the grisly hake he caught, nor considered the rubies the light-house scattered on the waves, or how the moon sprinkled down silver before him. He did not mind the touch of the balmy wind that blew across his weather-beaten face with the same sweet greeting that so gladdened us, but fished and fished, watching his line through the short summer night, and when a blush of dawn stole up in the east among the stars wound up his tackle, took his oars, and paddled home to Nabbaye with his booty—his 'fare of fish,' as the natives have it. Hake-fishing after this picturesque and tedious fashion is done away with now. The islands are girdled with trawls, which catch more fish in one night than could be obtained in a week's hard labor by hand." *

POWERS OF OBSERVATION.—The fishermen of the present day are, mentally, broader and more vigorous than those of former times. The management of the vessels requires more skill and presence of mind; the various labor-saving appliances in the rigging of the vessel, such as the patent windlass and the patent blocks, and various other contrivances of the same kind, have diminished the necessity for severe muscular exertion and the consequent exhaustion which, often repeated, must have a tendency to sluggishness of mind. The training, already described, through which a man must pass to become a successful fisherman, in a very large degree strengthens the mental faculties and develops at the same time great readiness and promptness of thought. The fisherman in a smaller vessel, to be successful, also needs to develop great powers of observation to protect himself and his boat from sudden changes of weather, and to follow the changes in the habits and motions of the fish from one season of the year to another. Many fishermen whom we have met have exhibited great aptness as observers of nature.

FISHERMEN AS INVESTIGATORS.—We need only refer to the wonderful contributions to science which have been made by the fishermen of the Gloucester fleet during the past three years, to demonstrate the interest which they have taken in matters which incidentally came under their observation. More than thirty Gloucester schooners have habitually for three years carried on their voyages a collecting-tank full of alcohol, in which they preserved every unusual species of animal which they obtained on their lines or from the stomachs of the fish as they dressed them. Their interest in the subject is an intelligent one, and they soon learn to discriminate between species and to save only those things which they recognize to be novel. Our lists of donations by the fishermen to the National Museum are published weekly in the Cape Ann papers. After specimens have been sent to Washington for identification they have anxiously awaited the letters which announce the result of their examination, and, after they have learned their names, adopt them into their vocabulary. They quickly become familiar with the English names which are applied to certain species, and in some instances adopt the Latin nomenclature. The curious fish known to naturalists by the generic name chimera, is also known to the fishermen by the same name. There are at least a hundred men in the Gloucester fishing fleet who keep track of all the new discoveries on the fishing banks, and are interested in learning the opinions of naturalists on the subject. When a vessel has brought in a tank full of specimens, the majority of the crew of ten to fourteen men are interested in knowing about their identification. Such an intelligent interest as this, is by no means confined to Gloucester, for fishing vessels from several other ports carry collecting-tanks. Some very important contributions to the natural history of the menhaden, for instance, the discovery of the fact that this species feed upon floating crustaceans, a fact which had long been sought after by trained naturalists, was brought to light last summer by J. F. Fowle, the engineer of one of the menhaden steamers. One of the Connecticut vessels fishing for the Charleston market, has rendered important service in collecting. Certain fishermen have

* Thaxter's Isles of Shoals, 1873, p. 76.

attained a national reputation as observers: men like Capt. N. E. Atwood, of Provincetown, the success of whose course of twelve lectures on ichthyology before the Lowell Institute, of Boston, is a matter of record; Capt. U. S. Treat, of Eastport, Me., who was for several years employed by the Japanese Government to instruct their people in the methods of fishing; Simeon Chaney, of Grand Manan, N. B., and others whose powers of observation are no less remarkable, although they have not come so prominently into notice. In the investigation the results of which are detailed in the present volume, as well as in the previous work of the United States Fish Commission, circulars containing from fifty to eighty questions have been sent out to fishermen all along the coast, and in this manner information has been sought regarding the general character of the fisheries of the coast, the natural history and methods of capture of the cod, the mackerel, the mullet, the menhaden, the lobster, and several other species. In few instances have the circulars failed to receive answers, and in the archives of the Fish Commission may be found many thousands of pages of manuscript, written by the hands of fishermen, in which are given probably more important and previously unobserved facts concerning the natural history of these species than had ever hitherto been brought to light by the labors of all the trained naturalists of America. The Fish Commission has published a report of over five hundred pages upon the natural history of the menhaden and the menhaden fisheries, the material for which was supplied in large part by men engaged directly in the fisheries. A similar report, the material for which was obtained in the same manner, has recently been published. In preparing the chapter on the whale fishery for this report it has been necessary to correspond with many retired whalers, and the answers have been explicit and satisfactory in the extreme, far more so than answers to circulars relating to another subject which were sent out to sportsmen and professional men throughout the interior of the country. In fact, it is hardly possible to praise in sufficiently high terms the intelligent interest and the valuable coöperation which our fishermen have everywhere shown in the preparation of this report upon the fisheries. They rarely withhold information, and almost without exception, even at great inconvenience to themselves, render every aid in their power. If space would allow, an interesting illustration of the intelligence of the men engaged in the American fisheries might be given by printing in full some of the letters in response to circulars. Not only do they convey in a very concise and intelligible manner the information which was sought for, but the language is strong, idiomatic English, the grammar and orthography are faultless, and the handwriting graceful and legible.

In response to the invitation of the Commissioner of Fisheries, many fishermen of Gloucester and some from other ports have kept journals of their voyages, noting down the movements of their vessels, the locations of the fishing grounds as they change from day to day, and the peculiarities in the movements of the fish which fall under their observation.

There are before us at least thirty journals of this description, some of them covering a period of three or four years, and, in addition to discussing the points already mentioned, describing the peculiar methods of fishing employed by them. Many of these men, and many of the men on the menhaden steamers, have voluntarily kept records of the temperature of the water three times a day during the entire fishing season, appreciating the importance of placing upon record information of this sort for the use of those who are studying the habits of the fishes and methods for improving the fisheries. The records received have, as a rule, been kept in an accurate and satisfactory manner.

Three or four representatives of the Fish Commission have been sent out upon long trips on board of fishing vessels to study the methods of the fisheries and the natural history of the regions

visited. Mr. Scudder went to Greenland on a three months' cruise; Mr. Osborne to the Grand Bank on a three months' cruise; Mr. Newcomb to the Western Bank on a three weeks' cruise. Other representatives of the Fish Commission have for three years been accustomed to visit almost every vessel as it entered the harbor of Gloucester on its return from a fishing voyage, and the same system of visiting the vessels has been, to a less extent, carried on upon every part of the coast; and, almost without exception, these gentlemen have been received with courtesy, all information given them which they desired, and usually intelligent interest shown in the work in which they have been engaged.

It is due to the fishermen to say that they gave their services without the offer or the hope of remuneration of any kind. A number of the fishermen of Grimsby, England, two or three years ago, kept logs of their voyages in a similar manner, but it was in consequence of offers of valuable prizes. It is but fair to say, however, that many English fishermen and boatmen have manifested the same spirit of appreciation of scientific work to which we have just referred as having been displayed by the fishermen of the United States, and some of them, like Capt. David Gray, of Peterhead, have made for themselves excellent reputations as observers.

ENTERPRISE.—The enterprise of the New England fishermen is strikingly manifested by the manner in which they stand ready to adopt new improvements in the methods of fishing. There are, of course, conservatives among them, but the most enterprising of the class are ready to adopt at once any device which seems to promise greater efficiency in the prosecution of their business. It is not in this place necessary to describe in detail the manner in which improvements have been brought about. We need only refer to the rapid and general adoption of the patent windlass on the off-shore vessels; to the sudden changes from the old methods of drailing for mackerel to that of catching them with jigs, and again from that method to the use of the purse-seine; to the extensive and speedy adoption of steamers in the menhaden fishery; to the improvements which during the past one hundred years have been brought about in the model of the whale-boat, and within one-quarter of that time in that of the seine-boat; to the energetic manner in which gill-nets have been brought into use in the cod fishery, and the equally great improvements which have of late years been made in other fisheries.

HARDIHOOD AND DARING; SEAMANSHIP.—There is no hardier or more daring race of seamen in the world than the sailor fishermen of New England. Their training begins at an early age and their constant occupation on board the boats and vessels soon gives them a perfect familiarity with the waves and the winds in all their phases of manifestation. There is no coast upon which the winds and weather are more changeable and more trying to the endurance and skill of the seamen than that of North America from Florida to Davis' Straits. There are no fishermen in any other part of the world who venture so far from the shore at all seasons and carry on their fisheries to so large an extent in the open sea, hundreds of miles from any harbor. Then, too, there is no vessel which requires so much skill and judgment in its management as the American schooner; none which is, perhaps, more capable of remarkable achievements when properly managed, and none which is more liable to disaster when in the hands of the unskillful. In the same way the favorite American fishing boat, the dory, is peculiar in its demands upon the pluck, strength, and keenness of the person who is controlling its movements. Certain other boats, such as the whale-boat and the seine-boat, which are exclusively used in certain branches of the American fisheries, require less skill to prevent disaster in their use, but quite as much in their proper and successful management. The last-mentioned boats may be regarded as the special development of the ingenuity and observant experience of the fishermen. In no instance have the fishermen of other

countries essentially modified, within the past century, the general form of their fishing boats and the appliances which belong to them. Exception should be made, perhaps, with reference to the introduction of ketch-rigged cutters and steamers into the fisheries of Northern Europe, remarkable progress having been made, especially by Great Britain, Germany, and Holland, during the past twenty-five years in the adoption of fleetier and more manageable vessels for the herring, cod, and beam-trawl fisheries. The numerous labor-saving appliances, which may be found on board of the American fishing vessels and fishing boats, are, for the most part, peculiar to the United States.

At the International Fishery Exhibition at Berlin, the contrast between the appliances of this kind in the European and American exhibits was very noteworthy and was the subject of constant remark among the European fishermen who visited the American section. The demand for the speedy adoption of so many appliances in the rigging of vessels and boats may be fairly accounted for by the fact that our fishermen feel the necessity of every aid that can be rendered them in the trying circumstances to which they are so often exposed. It should also be mentioned that the necessity, which is especially felt by our fishermen, of attaining great speed for their fishing vessels, has led to the development of a high grade of seamanship, and has led also to the adoption of many labor-saving appliances, by the aid of which more sails and larger sails can be managed with ease and rapidity by ordinary crews.

There can be no question that seamanship of a very high type is found among the fishermen. While many methods are common to the fishing fleet and to the merchant fleet, the fishing vessels are often obliged to execute maneuvers which would be impossible to the heavier vessels in the merchant marine.

The fishing vessels are smaller, sharper, and carry sails which are larger in proportion to the size of their hulls. They are, therefore, swifter, and, as the fishermen express it, "handier." Relying upon the speed and "handiness" of his vessel, the fisherman takes greater risks in running for harbors in heavy weather and is consequently frequently exposed to emergencies which put to the utmost test his own seamanship and the stanchness and manageability of his vessel.

Many of the most skillful masters of merchant vessels have been trained in the fishing school; and during the late war between the States it was not unusual for fishermen to enter the Navy and to rise to responsible positions.

As might naturally be expected, the fishermen are courageous almost to a fault, both in the performance of ordinary duties and in rescuing men or vessels in peril. Some of the rescues accomplished by them will be mentioned in the chapter on public services.

"Theirs is a life of toil," writes Mr. Procter, "and although fortune smiles upon them occasionally and sends a good school of fish, yet they spend hours and hours at the rail, in the bitter cold of winter, waiting for a bite—'grubbing,' as it is termed—with a family at home, whom they love as well as any one loves his own; and the bread of this family depending upon the catch of fish. Oftentimes these fathers will lie awake at night in their berths, tossed up and down by the waves of Georges, each hoping that he may do well this trip for the sake of his loved ones who are in need of many things for their comfort. This is no fancy picture, but the earnest facts in the lives of the married fishermen, who cannot stay at home in winter, because there is bread to win, and they must win it. Theirs is no holiday existence, but a continued grappling with the elements, a struggle for life, with storm and old ocean in its anger to meet; and with pluck and daring they wring success from the very verge of the grave."

36. SUPERSTITIONS.

THE CAUSES OF SUPERSTITION.—It is customary among writers to give fishermen credit for an extraordinary amount of credulity and superstition. There are among the fishermen superstitious men, just as there are among their kindred on shore; while, on the other hand, the more intelligent and practical men among them, especially those born in the United States, are, perhaps, among the least superstitious of men, certainly as little credulous as any class of sea-faring men. It is not unusual to find the master of a fishing vessel, while humoring the prejudices of his crew, himself thoroughly incredulous as to the power of any supernatural influences over the movements of the vessel or the success of the voyage.

Mr. J. P. Gordy thus writes concerning some of the superstitious notions among the Gloucester fishermen:

"I will not undertake to say to how many causes superstition may be due, but one cause, at least, every one will admit—a weakness of imagination and reason. Whenever you find a mind too weak to form such a conception as law, you find a mind which, if left to itself, will be superstitious. The development of the religious notion may modify the form of the superstition, but with that I do not propose to deal, since it is at present among fishermen in too varying proportions to make valid any conclusions that may be drawn therefrom. Now, in most circles of society the weaker minds are not left to themselves. They borrow the opinions as they do the manners of the highest culture and the best intellects in the circles in which they move. Those pronounce superstitions ridiculous and they echo their laugh. Even then the thoughts in their minds answering to abstract terms have a grotesqueness that would deserve to be called superstitious had not that name come to indicate a peculiar class of grotesque ideas. Now fishermen are very emphatically left to themselves. They have as little culture, as little contact with culture, as any class in the land. The most intelligent among them are prevented by their limited opportunities for intercourse from wielding the influence which naturally belongs to power, and superstition, as a rule, is the natural result. This is especially so when you take into consideration another cause which works with peculiar force among fishermen. I think that among people whose mental structure inclines them that way superstitions are more or less prevalent according to the frequency with which they come in contact with variable and incalculable events. Superstitions are due, in part at least, to the cause-seeking instinct; and when a new phenomenon appears, or an old one at times and under circumstances which cannot be predicted, this instinct demands satisfaction. Now, of all classes in the world, fishermen deal with phenomena with the cause of which they are most thoroughly unacquainted. When and from what quarter the wind will blow; when and why fish will be abundant; why the schools are large at some times and small at others—are questions they cannot answer. These are the facts which determine their success and upon which their observation is constantly directed, and unless the fisherman has the balance of mind which enables a man of strength to hold his judgment in suspense, he is likely to assign a cause which, if realized in his imagination, is almost certain to be a superstition. From these three causes, therefore—their lack of intelligence and culture, their lack of contact with these, and their constant observation of irregular facts—fishermen as a class are extremely likely to be superstitious."

Without further discussion as to the causes of superstition, we will consider some of the most common and widespread superstitions—such as may be found on any fishing vessel, and such as are always firmly believed in by many of the crew. We shall speak particularly of the superstitions prevalent among the Gloucester fishermen. Among the fishermen of European birth, so many of whom may be found on the whaling and other vessels on the coast of California, entirely

another class of superstitions doubtless prevail, similar to or identical with those current in the countries whence they came.

The superstitions of the fishermen may be roughly classified into three groups: (1) Causes and indications of ill luck; (2) superstitions regarding the weather and other natural phenomena which may or may not relate to causes; (3) superstitious usages which have no special bearing upon the welfare of the fisherman.

CAUSES AND INDICATIONS OF ILL LUCK.—A Jonah is any person, thing, or act which is supposed to bring ill luck upon a voyage. It is characteristic of the fearlessness of the Gloucester fisherman and the energy with which he throws himself into his occupation that these prejudices of ill luck are rarely applied to the fate of the vessel itself. Concerning this the men have but little anxiety, their whole interest being in the successful completion of the voyage. There are many kinds of Jonahs.

Certain persons are often selected by the fishermen as Jonahs, being those men who have been unlucky in their fishing voyages. The belief in luck is very deep-seated. When a vessel is unlucky on one of its voyages some of the crew are pretty certain to leave and to ship on other vessels. In the course of constant changing from one vessel to another certain men chance for a number of successive voyages to ship on board of unsuccessful vessels. The "ill luck" of these men soon becomes known among their comrades, and they are branded as Jonahs. A man may be extremely successful for a number of years and later he may fail on a few voyages, and it is at once said of him that his luck has changed and that he has become a Jonah. Men are sometimes discharged from vessels because of their reputation as Jonahs, although no other fault can be found with them. Sometimes when a vessel is unlucky the crew resort to a strange method of determining the unlucky one. They induce the cook to put a nail or a piece of wood or coal in a loaf of bread, and the man who happens to get this is declared a Jonah. It has been observed, however, that when the cook's verdict has been pronounced against a man who holds a good reputation as a fisherman and lucky man it has little effect. "Luck" is everything, and no kind of divination will counteract its influence upon the reputation of its happy possessor. Sometimes the fisherman resorts to strange expedients to free himself from the odor of "ill luck" which clings to him. For instance, he will carry his bed-sack on deck and set it on fire, and fumigate himself thoroughly, for the purpose of exorcising the evil influence.

Vessels sometimes get the reputation of being Jonahs. These vessels have considerable difficulty in getting crews until their luck changes. They are sometimes withdrawn from the fisheries on this account. The schooner *Florence*, which was sold from Gloucester to New London, and afterwards made exceedingly successful fur-sealing trips in the Antarctic Ocean, once had a bad reputation as a Jonah, which perhaps influenced her owners to take her out of the fisheries. The same vessel subsequently transported the Howgate expedition to Cumberland Sound.

Certain articles of personal property or apparel are thought to be Jonahs. A man carrying a black valise or wearing white woolen stockings or blue mittens would find much difficulty in shipping on board of a Gloucester vessel. A black valise is regarded with special disfavor, and the almost universal use of white mittens and nippers is largely due to this common prejudice regarding color. It is not uncommon for the more influential and skillful fishermen to carry with them some of these suspicious articles for the purpose of overcoming the prejudices of their associates, and the influence of such men is having good effect. There are other kinds of Jonahs which are not so generally believed in. Some fishermen, for instance, think that it is a Jonah to make toy boats or models on board the vessel; others, that a fiddle or a checker-board is a Jonah; others, even, that it is a Jonah to leave a bucket half-full of water on deck, or to soak mackerel in a bucket,

saying that "so long as you soak them in a bucket you will never get enough to soak in a barrel." Some think it is a Jonah, when a vessel is coming to anchor on the Banks and is "sticking out" her cable, to have a splice stop in the hawse-pipe, and it is frequently remarked by such that the vessel will not be successful in that berth, and the result will be that she will have to change her position. It is also thought, by a very few however, that it is a Jonah to have a dory, in leaving the vessel, turn round from right to left or in a direction contrary to that of the sun. Some skippers think it is a Jonah to keep the vessel's deck clean when on the fishing grounds, and they will allow only such cleaning as is absolutely necessary. Others, on the contrary, are very particular in the matter of having their vessels kept clean.

The prevalent belief in "luck" has already been mentioned. Certain vessels and men acquire the enviable reputation of being the luckiest in the fleet, and it is always thought a piece of good fortune to be able to ship on board of such vessels or in company with such men. Certain articles also gain the reputation of bringing good luck. For instance, during the past two or three years, since the United States Fish Commission has been sending out collecting tanks full of alcohol on some of the vessels, it has come to be regarded by many of the fishermen as a matter of good luck to have one on board. One of the most successful Gloucester skippers went out on a voyage in 1880 without the tank which he had been accustomed to carry and was unsuccessful. Upon his return he came to the headquarters of the Commission and begged for a tank, saying that he would not, on any account, go out again to the fishing grounds without collecting materials on board. Such instances as these are mentioned simply to indicate how great importance is given to little things, and to show how the superstitious instincts of these men lead them rapidly from one belief to another, while the general skeptical tendency of the age prevents any very strong and permanent belief in any particular form of superstition.

UNLUCKY DAYS AND ACTS.—The belief that Friday is an unlucky day still holds among many of the fishermen, but the old idea is fast dying out. A quarter of a century ago few Gloucester fishermen would go to sea on a Friday, but at the present time little attention is paid to this; and in this respect the fishing vessels are perhaps in advance of many vessels in the merchant marine and in the Navy. This revolution in opinions has been brought about simply through the influence of a few independent and determined men.

Certain acts are considered unlucky; for instance, to kill a "Mother Carey's chicken" or petrel. This superstition is also going out since many of the vessels during the past years have been obliged to kill these birds for bait. It is regarded unlucky by a great many fishermen to drive a nail on Sunday. To combat this idea certain skippers have been known to amuse themselves on that day when at sea by driving nails. It is unlucky to leave a hatch bottom side up upon the deck; such an act is supposed to be the possible cause of some future disaster to the vessel.

Accidents, too, are unlucky and are sometimes regarded as sufficient reasons for disaster. To let a hatch fall down into the hold is considered especially unfortunate, while to break a looking-glass is disastrous not only to the vessel but to the person, family, and friends of the man who is the cause of the breakage.*

Fishermen are not as a rule given to forebodings of ill. They always go to sea with brave hearts, the idea that they may never return to port seldom being allowed consideration, no matter how many of their comrades have been lost within a few days.

* The superstition regarding the ill effects which may result from breaking a looking-glass is very wide-spread on shore as well as among seamen. In various parts of the United States—in the cities as well as in rural districts—the remark is often heard that the breaking of a glass indicates "seven years hard luck." It will be seen that this belief is not confined to fishermen, but, like many other superstitions with which they are credited, is doubtless borrowed from people on shore.

BELIEFS REGARDING NATURAL PHENOMENA.—Among fishermen we find the ordinary beliefs regarding the influence of changes of the moon upon the weather. The fisherman, like any other sailor, will often whistle for a wind or will stick his knife into the aft side of the mast to insure a fair wind. The fishermen observe carefully the direction of shooting-stars, thinking that the wind will come from the direction toward which the stars shoot. There is a common belief in Maine that the flood-tide brings in a wind, that the wind is likely to die out with its ebb, also that it is more likely to rain on the ebb than on the flood; and this belief is more or less common all along the New England coast. In Maine the fishermen believe that children are always born when the tide is at the full and die when it is ebbing, and that only at this latter stage of the tide do deaths occur.

When the sun "sets up its backstays," or "draws water" in the morning, it is a sign of foul weather; at night, of fair weather; "sun-dogs," or parhelia, indicate foul weather.

When the wind backs, or veers from right to left or against the sun, it is believed that it will not continue steady. This belief is so common among seamen that an old distich tells us that:

When the wind backens against the sun
Trust it not, for back it'll run.

If the wind moderates with the setting of the sun, it will rise again when the sun rises.

The peculiar appearance in the water which the fishermen describe as "a crack in the water," seen in calm weather, is the sign of an easterly wind.

The fire of St. Elmo, the "composants" (*corpo santo*?), as the fishermen call it, is regarded as a natural phenomenon. It is believed to rise higher upon the mast as the storm increases, and at the culmination of the storm to reach the highest point on a vessel's spars or rigging.

Backing winds are generally followed by unsettled weather; hauling winds are thought to indicate settled weather.

The following are old saws of general prevalence:

Mackerel sky and mares' tails,
Make lofty ships carry low sails.

Rainbow in the morning,
Sailors' take warning;
Rainbow at night,
Sailors' delight.

Evening red, and morning gray,
Is a sure sign of a pleasant day;
But evening gray and morning red,
Will bring down rain upon your head.

If the morning is marked by an easterly glin,
The evening will bring rain to wet your skin.

If in the southwest you see a smurry sky,
Douse your flying kites, for a storm is nigh.*

Some of these beliefs concerning the weather doubtless have more or less foundation in fact, and are based on a close observation of results growing out of natural causes, though the "weather-

*On the east coast of the United States and British North American Provinces storms generally follow more or less closely the direction of the Gulf Stream, which, north of Cape Hatteras, closely approximates to a northeast course. Therefore, an easterly or north-easterly storm "begins to leeward," as the fishermen say; that is, it gradually moves to the northeastward, notwithstanding the wind may be blowing heavily from that direction. As a result, the first indication of a storm, particularly in winter, is generally noticed in the changes that appear in the sky to the south and westward. If the sky assumes a hazy, greasy look—called "smurry" by the fishermen—with small patches of leaden or inky clouds, a storm is imminent; here lies the force of this distich. The same rule applies to the first distich in regard to the "easterly glin;" since, if the morning sky is specially clear in the east, so as to form a glin, it is generally thick with an approaching storm in the opposite direction.—J. W. C.

wise" observers may not always be able to explain the relation between the "signs" and the changes which they predict.

SUPERSTITIOUS USAGES.—Some fishermen will not have their hair cut except when the moon is increasing in size, fearing that otherwise their hair will fall out. This idea, which is akin to the common one found throughout the rural districts of the Eastern and Middle States that animals killed in the waning of the moon will shrink when cooked, is by no means peculiar to the fishermen. The fishermen of former days, like other sea-faring men, were accustomed to wear ear-rings to improve their eye-sight; but this custom is almost, if not entirely, extinct among the American-born fishermen. Once in a while a veteran is still to be found with the picturesque old ear-rings in his ears. The European fishermen of California and the Southern States still adhere to this practice. Some fishermen carry potatoes in their pockets as a preventive of rheumatism, and wear nutmegs round their necks to cure scrofulous or other humors. These usages are also shared by hundreds of thousands of our shore population, who carry in their pockets the "lucky-bones" of fishes, certain bones of animals, as well as horse-chestnuts and other vegetable products as prophylactics. Many of the Roman Catholics among the fishermen of course wear amulets as personal safeguards. A fisherman who has wounded his finger with a fish-hook will immediately stick the hook into a piece of pine wood, thinking that he thus may hasten the cure of his wound. Warts are supposed to be removed by counting them and pronouncing over them a certain formula of words. In dressing codfish, some fishermen always save the largest fish to dress last. It is a very common custom to nail a horse-shoe on the end of the bowsprit for good luck. Among the French Canadians employed on our fishing vessels there are a few who still retain their ancestral belief in spirits and fairies; and the Scotch and Scandinavians and others have brought over with them the folk-lore of their fatherland. They soon become ashamed of talking about such beliefs. Whatever their private opinions may be, they seldom refer to them after having been associated for a few years with their unpoetical and skeptical shipmates.

A curious custom is found on many of the cod vessels, especially those of Cape Cod, connected with the process of dressing the fish. After a fish has been decapitated, its body is passed by the header to the splitter. If the body still exhibits signs of life, the splitter will usually ask the header to kill the fish, which he does by a blow upon the back of the skull. This act, performed upon the severed head, is supposed to have an immediate effect upon the body, which is in the hands of another man. A Gloucester fishing captain of thirty years' experience, who sits near us while we write, remarks: "*It is a singular thing, but it is surely true, that when the head is treated in this manner the body always straightens out.*"

37. DIALECT.

PECULIARITIES OF DIALECT.—Among the native-born fishermen of New England, particularly those of the rural districts of Cape Cod and Maine, a very pure, forcible English dialect is spoken. The inhabitants of this region retain the peculiar modes of expression in use among their English ancestors, who came to this country two hundred years or more ago. It is estimated that 80 per cent. of the inhabitants of Cape Cod at the present day are lineal descendants of English ancestors who settled the towns of that district between 1620 and 1750, and the percentage is probably equally as great, if not larger, on the coast of Maine. As is well known, very many of the English immigrants to these regions were men of education and good family. As a consequence the English of the shore populations and of the fishermen belonging to those districts is pure, idiomatic, and strong. Many provincial words, or words which were in common use in England two centuries ago and are now marked as obsolete in the dictionaries, are still in use among

them. There is now in preparation, in connection with the work of the United States Fish Commission, a dictionary of words and phrases in use among the fishermen of the United States, which, when published, will afford much material deserving of the attention of philologists. There are many expressive words and phrases in use among the fishermen—the technical language of their handicraft applied to the operations of daily life—which are full of meaning to those who know enough of fishing to understand them. Various names for tools and operations connected with their trade have been coined by them which are peculiar and have never found place in dictionaries. Slang is, as might be expected, very popular, and the slang phrases invented by the newspaper paragrapher, the negro minstrel, and the actor in the variety theater are as current among them as in the streets of our towns and villages. The ordinary professional slang of seamen is also prevalent among them, its vocabulary being greatly increased by slang used only by the fishermen themselves.

Mr. Charles Nordhoff, in a collection of short stories published under the title "Cape Cod and All Along Shore," has given excellent illustrations of the Cape Cod dialect, particularly that of Chatham, Harwich, and the neighboring towns, the truthfulness of which is all the more apparent when compared with the dialect in Miss McLean's "Cape Cod Folks." "Peter Gott, the Cape Ann Fisherman," a story by Dr. Joseph Reynolds, is also a treasury of good old Cape Ann language. The "Fisherman's Own Book," the "Fisherman's Memorial and Record Book," and "The Fisherman's Song Book," three little volumes published by Procter Brothers of Gloucester, contain many verses in dialect.

The following lines by Hiram Rich, of Gloucester, represent a fairly satisfactory attempt—perhaps the most successful yet made—to record the dialect of the fishermen of the olden time:

THE SKIPPER-HERMIT.

For thirty year, come herrin'-time,
Through many kind o' weather,
The "Wren" an' me have come an' gone,
An' held our own together.
Do' know as she is good as new,
Do' know as I am, nuther;
But she is truer'n kit' an' kin,
Or any but a mother.
They're at me now to stay ashore,
But while we've hand an' tiller,
She'll stick to me an' I to her,—
To leave the "Wren" would kill her.
My feet have worn the deck; ye see
How watches leave their traces,
An' write on oak an' pine as plain
As winters on our faces!
But arter all is said an' done,
There's somethin' sort o' human
About a boat that takes at last
The place o' child and woman;

An' yet when I have seen some things—
Their mothers let me toss 'em—
My boat, she seemed a barnacle
'Longside a bran-new blossom.
Sometimes to me the breeze off-shore
Comes out upon the water,
As if it left the grave of her—
No wife to me nor daughter.
Lor! if I knowed where green or no
The turf is sweet above her,
I'd buy a bit o' ground there,—wide
As a gull's wings would cover.
We know the tricks o' wind an' tide
That mean an' make disaster,
An' balk 'em, too—the "Wren" an' me—
Off on the Ol' Man's Pastur'.
Day out an' in the blackfish there
Go wabblin' out an' under,
An' nights we watch the coasters creep
From light to light in yonder.

An' then ag'in we lay an' lay
 Off Wonson's Cove or Oakses—
 None go by our compass-light,
 Nor we by other folkses.
 Ashore, the ball-room winders shine
 Till weary feet are warnin',
 But here an' there's a sick-room light
 That winks away till mornin'.

An' Sundays we go nigher in,
 To hear the bells a-ringin',—
 I aint no hand for sermons, you,
 But singin's allers singin'.
 The weathercocks—no two agree—
 Like men they arg' an' differ,
 While in the cuddy-way I set
 An' take my pipe, an' whiff her.

My pipe—eh! p'ison? mighty s-l-o-w;
 It makes my dreamin' clearer,
 Though what I fill it with now-days
 Is growin' dearer 'n' dearer.
 I takes my comfort when it comes,
 Then no lee-lurch can spill it,
 An' if my net is empty, Lor'!
 Why, how can growlin' fill it?

An' so we jog the hours away,
 The gulls they coo an' tattle,
 Till on the hill the sundown red
 Starts up the drowsin' cattle.
 The seiners row their jiggers by;
 I pull the slide half over,
 An' shet the shore out, an' the smell
 Of sea-weed sweeter'n clover.

The following sketch, quoted from a Boston newspaper, contains a fair example of the fisherman's dialect: *

"'Wall, you, I see another fisherman has gone down,' said a rugged, weather-beaten veteran of the sea to a reporter who, as was his wont, had invaded the quarters of the old salt near Commercial wharf. The speaker sat on an upturned keg, and had just finished reading the account of the loss of the *Maud S.*, which had gone down near Half-Way Rock, off Portland Harbor, not long before.

"'It's cur'ous. Sometimes a vessel 'll go down 's easy's nothin', 'n' then agin she'll live whar you wouldn't say th' wus a ghost of a show. Now, thar was the *Rattler*, pitched over the shoals off Cape Ann at midnight, some thirteen years ago, in a gale of wind, 'n' come right side up 'n' got into port safe with every man on board,' and the old man paused and patiently waited for the usual—

"'How was that, cap'n?'

"With a preparatory 'wall,' while a satisfied look overspread his face, the captain continued:

"'One of the wust shoals on the New Englan' coast is 'bout twenty-two league off Cape Ann, called Cashe's Shoals; yet fur all that th'r ain't much said 'bout 'em, which I never could explain, fur more vessels uv gone down thar than on any shoal of the same size along the coast.'

"'How large are the shoals?'

"'Wall, sailin' either side a quarter 'v a mile an' you're in sixty or seventy fathom, but right on the shoals, which is only a few rod across, the water ain't much over twenty feet deep. Why, it's so shaller I've seen kelp growin' up on top o' the water, an' when thar's a blow an' the big seas come rollin' in thar's I've seen 'em—a hundred feet choppin' down on the bottom—I tell *you* it's cruel. No ship could live thar in a storm, an' only smaller vessels can go over in calm weather. Wall, the *Rattler*, as I was a speakin' of, wus comin' 'long down the coast from Newf'n'land loaded with frozen herrin'. The night wus a black one, 'n the cap'n was off his reck'nin'. Least-

* The facts in the case are truthfully described. The *Rattler*, while returning to Gloucester from a voyage to Newfoundland, in January, 1867, was overtaken by a furious gale in the vicinity of Cashe's Ledge. She was struck by a heavy sea, thrown on her beam ends or rolled over, and finally righted with the loss of both masts. She arrived in Gloucester a few days later.

ways, fust thing any one knowed, a big sea lifted the vessel an' pitched her forrard. She struck her nose on the bottom, an' just then another big one struck her fair in the stern, an' lifted it clean over the bow; her masts struck an' snapped off, an' she went over the shoals an' floated in deep water on the other side, fair an' square on her keel, with both masts broke off to 'ithin fifteen feet o' the deck.'

"Where were the crew?"

"Oh, they were down below. They said it was all over afore they knew what was up; they didn't sense it at all at first. They said, all it was they was settin' thar 'n then,' illustrating by a motion of the hand toward the ceiling and back to the floor; 'they struck the deck 'n then came down agin all in a heap on the floor. They got up on the deck, kind o' dazed like, an' thar she wus, a complete wreck.'

"How about the man at the helm?"

"Oh, he was lashed. But he said arterwerds, when he felt the old craft spinnin' over, he thought it was all over with him. He held on ter the wheel fur dear life an' never lost his grip; but I tell you that's a tremendous strain on a man.' And the old captain clenched his large muscular hands as if he thought he, too, for a time, was being subjected to the same strain. 'He wus pretty nigh gone; but they unlashed him, took him down below, and did for him all they could. Arter they got into port, he was laid up fur a long time, but finally come round all right.'

"How did they manage to get into port with their vessel a wrêck?"

"They had a fair wind, the current was in their favor, an' they finally fell in with a vessel that towed 'em in all right. That was the nar'rest 'scape I ever heerd of fur a vessel.'

"Their good angels were watching over the crew that night, sure. If any one but you, captain, had told me that story I must say I should have doubted it.'

"Wall, you needn't doubt it, for it's gospel truth, an' the man who owned the vessel was Andrew Leighton, of Glo'ster, an' the cap'n who sailed her was named Bearse.' And the veteran fish-dealer brought down his clinched hand upon an ice-chest that stood within reach with an emphasis that settled all debate more effectually than the most successful gag-law ever put in practice by the most astute politician."

DIALECT OF MARBLEHEAD FISHERMEN.—The first settlers of Marblehead came from the south of England, and many of them from the Guernsey and other channel islands, and the peculiarities of the dialects of their ancestors are still observable in this old town. Roads, in his History of Marblehead, says:

"So broad and quick was their pronunciation, and so strange were the idioms characterizing their speech, that a native of the town was known wherever he went. Nor was this peculiarity confined to any class or condition of men residing in the town. All shared it alike, of whatever rank or condition in life. The words were clipped off very shortly, and in some sections there was a slight difference in the dialect noticeable. The 'Cuny Lane' people always dropped the 'h' in speaking, and their vernacular was much like that of a cockney Englishman, in addition to that which betrayed them 'to the manner born.'

"Hardly a family in the olden time escaped with a correct pronunciation of its name. The name of Crowninshield became 'Grounsel;' Orne was transformed to 'Horne; Trefry was variously pronounced 'Duvy,' 'Tevy,' 'Trevye,' and 'Trefroy;' Quiner became 'Coonier;' Florence was clipped to 'Flurry,' and Thrasher was abbreviated to 'Trash.'

"So accustomed were many of the inhabitants to the cognomen by which they were known that in some instances they did not recognize their own names when called by them. An instance of this kind is related in the 'Life and Letters of Judge Story,' who was a native of the town. Once

while he was trying a case in the circuit court, in Boston, the clerk called out the name of one of the jury as Michael Treffrey (it being so spelt). No answer was given. Again he was called, and still there was silence. 'It is very strange,' said the clerk, 'I saw that man here not two minutes ago.' 'Where does he come from?' asked the judge. 'Marblehead, may it please your honor,' said the clerk. 'If that's the case,' said the judge, 'let me see the list.' The clerk handed it up to him. He looked at the same a minute and, handing back the list, said, 'Call Mike Trevyé' (throwing the accent on the last syllable). 'Mike Trevyé,' called the clerk. 'Here,' answered a gruff voice. 'Why did you not answer before?' asked the clerk. 'Treffrey is no way to pronounce my name,' said the jurymen; 'my name is Mike Trevyé, as the judge knows.'

"Another anecdote to the same purpose is related in the work: 'On one occasion, when some of our fishermen were in court to settle a mutiny which had taken place on the Grand Banks (of Newfoundland), one, on being called to state what he knew, said that the skipper and one of his shipmates had what he called a 'jor of ile.' The presiding judge in vain endeavored to get a more intelligible answer, and finally Judge Story was called upon, as usual, to act as interpreter to his townsman, which he did, telling the court that a 'jor of ile' in the Marblehead dialect was 'a jaw, awhile,' which, being interpreted, meant that the two men abused each other grossly for some time.

"Though the dialect once so general among the people is now almost extinct, there are many words used occasionally to know the meaning of which would puzzle a stranger. Often when any of the natives feel cold or chilly they will say they are 'crimmy.' If they lose their way in the dark and become confused or bewildered, they will say that they were 'pixilated.' In speaking of the ceiling of a room many of the older people still call it 'planchment.' When a lady on examining a piece of sewing finds that it is carelessly or improperly done, it is not unusual for her to call the work a 'frouch.' When food has been improperly cooked it is spoken of as 'cautch.' When very angry for any reason it is a common occurrence to hear some one exclaim, 'Squeal 'im up!' 'Squeal something at him!' or 'He ought to be squealed up!' which being interpreted means, 'Throw something at him!' 'He ought to be stoned!' 'Stone him!' A crumb or a small piece of anything is called a 'grummet,' and a sulky or ill-natured person is said to be 'grouty.'"

FISHERMEN OF GRAND MANAN.—A writer in the Gloucester Telegraph of July 16, 1870, says:

"The fishermen of Grand Manan have a *patois* of their own. When one of them speaks of his 'brush' you do not at first suspect that he refers to his hair. His boots are 'stompers,' while his knife is a 'throater,' and his apron a 'barvil.' His hook is a 'dragon,' and his boats 'pinkies,' 'pogies,' and 'jiggers.' He counts time by the tide, and covenants with the parson to marry him to Suke about 'slack water.' The various preparations of flour and meal are known as 'fish-smother,' 'duff,' and 'joe-floggers'; hard bread and apples are 'grunt.' He applies 'she' to everything, from his wife to a cart-wheel or clock."

38. LITERARY TASTES.

Through the great abundance of cheap publications, at the present day, the fishermen are enabled to provide themselves with literary entertainment at small cost. The liability of having valuable books impaired or destroyed is often a reason for not carrying them on shipboard. We quote the statement of Mr. A. Howard Clark concerning the general character of the literature sold to fishermen by the newsdealers of Gloucester. He writes:

"I have called upon the newsdealers to ascertain the character and quantity of reading matter sold to the fishermen. The result as to character is a little better than I expected. They do not read magazines, such as Harper's Monthly, Scribner's, or the Atlantic. The great favorites with them used to be trashy dime novels, but the large variety of story papers now published

has largely taken their place, although some are still sold. The following are the weekly papers taken by Gloucester newsdealers and read mostly by the fishermen: New York Weekly, 100 copies per week; Saturday Night, 90 copies per week; Fireside Companion, 90 copies per week; New York Ledger, 70 copies per week; Police News, 55 copies per week; Family Story Paper, 50 copies per week; Yankee Blade, 25 copies per week; Harper's Weekly, 20 copies per week; Frank Leslie's Illustrated, 20 copies per week. About 350 copies of the Cape Ann Advertiser are sold to the fishermen; some daily papers, when the fleet is in port, for home reading; and about 1,000 copies yearly of dime novels and cheap library stories, such as make up Seaside Library."

It is by no means unusual to find on board fishing vessels some of the choicest books in the English language—history, poetry, and biography.

Dickens' works are very popular among many of the fishermen; Shakespeare, Byron, Cowper, and Abbott's "Life of Napoleon" are among the works which we ourselves have seen on vessels.

Philanthropists might secure a very great influence over the fishermen of Gloucester and other ports by systematically supplying the vessels with a small library of well-selected books, or, better still, by establishing for the use of the fishermen a well-planned circulating library. The fishermen are men of active minds, and many of them have refined and studious tastes. Such a library should be in the charge of some person who could help the fishermen in selecting their books, and who would take pains to stimulate their interest in literary subjects.

In Gloucester alone are over four thousand men, half of whom, at least, would doubtless rejoice greatly over the possession of some such facilities for mental improvement.

39. MORALS AND RELIGION.

The question of morals and religion is extremely difficult to discuss. The fishermen are, doubtless, on an average, far superior in moral character to other classes of sea-faring men. In large ports, like Gloucester, whither flock the discontented, the disgraced, and the ne'er-do-wells, as well as the most enterprising and ambitious of the young men from the whole coast, there is, of course, less attention paid to the question of morals than in rural communities, and the general moral tone of the fishing classes is below the average for the whole coast. There are, however, in Gloucester hundreds of men of upright character and unimpeachable veracity, and hundreds more whose character for honesty and truth is unquestioned, but whose views upon other moral questions might be subject to criticism. There are very few indeed of the men in the Gloucester fleet who may properly be called religious. The very fact that they are at sea during all months of the year, and unable to give attention to any subjects except those directly connected with their occupation, accounts for the fact that fewer of them are identified with religious organizations than in the smaller towns, where the fishermen are on shore for at least half the year, and are surrounded by influences which would lead them to such association.

OBSERVANCE OF THE SABBATH.—The observance of the Sabbath is practically obsolete among the fishermen of Gloucester, when on the fishing grounds; though when they are making a passage to and from port it is not customary to perform any work except that which is necessary for the management of the vessel. There are, however, a few Gloucester fishermen who observe the Sabbath, a practice which is almost universal among the fishermen of Cape Cod and the smaller ports of Massachusetts, and some of those of Maine. It is believed that the captains of vessels from certain portions of Cape Cod would lose their commands, or would at least suffer much damage to their reputation as respectable citizens, if they were known to fish on Sunday. When the vessels are in port, Sunday is very generally observed everywhere along the coast of New England. The

families of our fishermen are almost always identified with some religious sect, and the churches of fishing ports are as well supported as those in any other section of the country.* In the whaling fleet where, as a rule, morality among the men is at low ebb, Sunday is rarely observed. It is a matter of history, however, that during the present century the masters of several whalers sailing from the eastern end of Long Island, although they came in with full cargoes of oil, lost their commands because they would not go in pursuit of whales on Sunday.

At two successive annual meetings, those of 1880 and 1881, the United States Menhaden Oil and Guano Associations unanimously passed a resolution to the effect that the steamers and other vessels belonging to members of this association should not be allowed to fish on Sunday.

Shore fishing is almost entirely suspended on Sunday in New England, and it is believed that the same practice is prevalent throughout the whole length of the Atlantic coast, extending even to the shad fishermen of the rivers. In fact, many of the laws which have been framed for the protection of shad in our rivers, provide a close time every week, from sunset Saturday night to sunrise Monday morning, taking advantage of the well-known practice of refraining from fishing on the Sabbath day.

The shad fishermen of the Saint John's River, Florida, fish on Sundays, though there is a general sentiment against this practice among the fishermen who are forced into it by the example of one or two of the most powerful capitalists.

PROFANE LANGUAGE.—The use of profane language is extremely prevalent among fishermen, and there are but very few vessels from any part of the coast on which oaths are not constantly heard; particularly is this so on Gloucester vessels. A few of the masters are opposed to the practice and endeavor to restrain it, but ordinarily no effort is made in this direction. Almost as common is the use of vulgar and indecent words. The atmosphere of the fishing vessels is full of coarse language, and the ears of young fishermen become so habituated to it that, not being

* One said to him, "Well, Jud, how many fish have they caught to-day at Star?" Jud looked askance, and answered like one who did not wish to be trifled with, "We don't go a-fishing Sundays."—*Thaxter's Isles of Shoals*, 1873, p. 102.

"While Mr. Brock resided at the Shoals he persuaded the people to enter into an agreement that, besides the Lord's day, they would spend one day in every month together in the worship of God. On a certain day, which, by their agreement, was to be devoted to the exercises of religion, the fishermen came to Mr. Brock and requested that they might put by their meeting that day and go a-fishing, because they had lost many days by the foulness of the weather. He pointed out to them the impropriety of their request, and endeavored to convince them that it would be far better for them to stay at home and worship God, according to their agreement, than to go a-fishing. Notwithstanding his remonstrance, however, five only consented to stay at home, and thirty determined to go. Upon this, Mr. Brock addressed them thus: 'As for you, who are determined to neglect your duty to God and go a-fishing, *I say unto you, catch fish if you can.* But as for you, who will tarry and worship the Lord Jesus Christ, I will pray unto Him for you that you may *catch fish till you are weary.*' Accordingly, the thirty who went from the meeting, with all their skill, caught through the whole day but four fishes, while the five who tarried and attended divine service, afterwards went out and caught five hundred.

"To a poor man who had lost his boat in a storm Mr. Brock said, 'Go home, honest man; I will mention the matter to the Lord; you will have your boat again to-morrow.' Mr. B., now considering of what consequence this matter, that seemed so small otherwise, might be among the untractable fishermen, made the boat an article of his prayers, and behold, on the morrow the poor man came to him rejoicing that his boat was found, the anchor of another vessel that was undesignedly cast upon it having strangely brought it up from the unknown bottom, where it had been sunk.

"During the ministry of the Rev. Mr. Moody at the Shoals one of the fishing shallops, with all hands on board, was lost in a northeast storm in Ipswich Bay. Mr. Moody, anxious to improve this melancholy event for the awakening of those of his hearers who were exposed to the like disaster, addressed them in the following language, adapted to their occupation and understanding: 'Supposing, my brethren, any of you should be taken short in the bay in a northeast storm, your hearts trembling with fear, and nothing but death before you, whither would your thoughts turn? What would you do?' 'What would I do,' replied one of these hardy sons of Neptune, 'Why, I should immediately hoist the foresail and scud away for 'Squam.'"—*Coll. Mass. Hist. Soc.*, vol. vii, 1st series, pp. 247-252.

accustomed to more refined discourse, they think nothing whatever of it and see no impropriety in its use.

TRUTHFULNESS: SOCIAL VICES.—Concerning other virtues, such as truthfulness, honesty, and general reliability, fishermen do not appear to have any special peculiarities, but it is believed that they will compare favorably with other men of similar grades in society.

Social vices are much less common among fishermen than among other sea-faring men, except in the largest ports; the morality of the communities to which fishermen belong is unimpeachable, or, at least, will compare favorably with those of any other section of the country, while in the larger towns the social evil is by no means so prominent as in the manufacturing towns. There are, of course, depraved men among the fishermen whose vicious instincts are increased by the irregular character of their occupation, but a large majority of the fishermen, even of Gloucester, are pure in their morals.

The laxity of morals, which is often attributed to certain classes of our fishermen and to the provincial ports which they visit, in connection with their cruises upon the off-shore banks, is believed to be very much exaggerated. Outside of the larger ports, as has been stated, there is but little in the practice of the men upon the fishing vessels which can be criticised by those who are familiar with their habits.

INTOXICATING DRINKS.—In most of the fishing towns along the coast spirits cannot be obtained upon any pretext whatever, except in the large cities which incidentally engage in fishing. There is no fishing port except Gloucester in which fishermen, or indeed any strangers, would not find extreme difficulty in obtaining intoxicating liquor. In Gloucester strenuous efforts have been made to overthrow the liquor traffic, both by prohibition laws and license laws, and it cannot be said that liquor is there freely sold, although those who are familiar with the town have but little difficulty in obtaining it. Drunkenness is not a vice to which fishermen are addicted.

In the chapter upon "Life on shipboard," allusion is made to the custom, once universally prevalent, of carrying a supply of rum on Massachusetts vessels, and it was no less common for the shore fishermen to carry their jugs with them when they went out in their boats upon the fishing grounds. This custom has become obsolete to such an extent that the shipping articles of every fishing vessel require that "no ardent spirits shall be carried on board," and many Gloucester shippers are so opposed to intemperance that they promptly discharge men who are known to have been guilty of drunkenness. The medicine-chest is not supplied with liquor, even though the use of so important a restorative would perhaps frequently be attended with good results. It seems as if public sentiment were somewhat too radical when it forbids to the fishing vessels the privilege of carrying a small supply of spirits for use in cases of exhaustion. Many experienced men, however, agree that such benefits are more than counterbalanced by the evils that would result from the practice of carrying even the smallest quantity of intoxicating spirits on board of our fishing vessels where discipline is so entirely absent as it is at the present time.

Much trouble is caused by the free sale of liquor in the ports of Newfoundland, where our cod fishermen frequently make harbor, and until within a few years the same difficulty has been met with in the ports of Nova Scotia and Cape Breton. At the present time prohibitory laws are there enforced with great strictness, and nowhere save in Halifax and some of the other large ports can liquor now be bought. In ports where liquor is sold, vessels are often detained on account of men who get drunk and refuse to go on board, or become involved in brawls.

The "temperance reform" in Gloucester in 1876 seems to have had a wide-spread influence among the fishermen—an influence which is felt to the present day. The local papers for some months were full of the subject. In the Cape Ann Advertiser of February 25, 1876, is printed a

list of twenty-two vessels from Gloucester manned entirely by temperance men. On the 3d of March a grand reception was given by the "Reynolds Temperance Reform Club," of Gloucester, and in the street procession four hundred George's fishermen marched.

The oystermen of the Chesapeake are, as has already been remarked, lawless and quarrelsome, and the same characteristics are met with among the other fishermen of the same region, many of whom are engaged in the oyster fisheries part of the year, in the shad fishery in the spring, and the menhaden fishery in summer. Conflicts occasionally occur between fishermen from different sections. The war between the Maryland and Delaware fishermen in 1876 was a serious affair, resulting in injuries to several men.

40. THE FISHERMEN'S LIFE ASHORE.

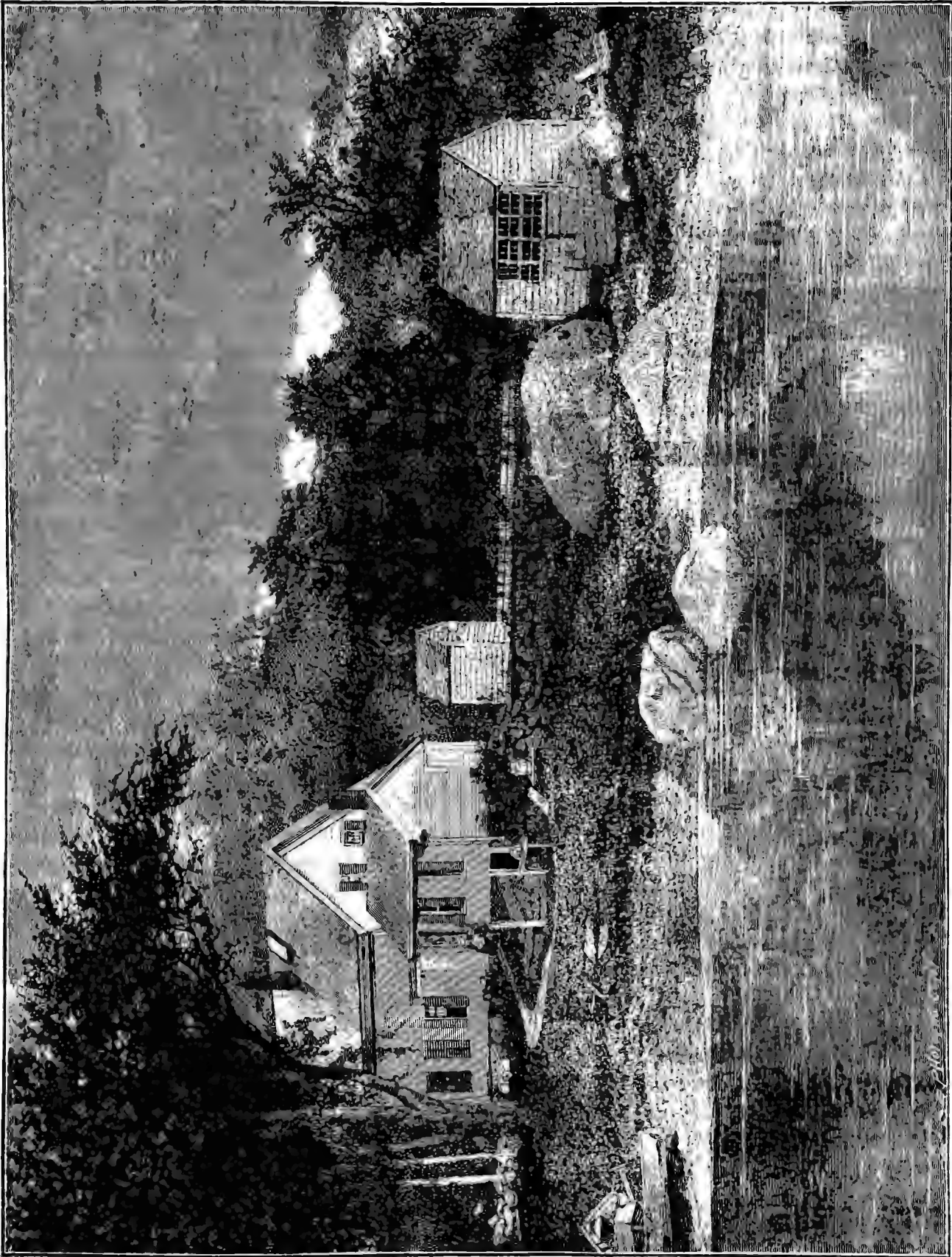
HOME LIFE.—The home life of the fishermen has already been partly described under the head of education. In Gloucester, perhaps from twenty-five to thirty per cent. of the fishermen are married and have homes of their own, while in other fishing ports the percentage of married men is still greater, and very few indeed among the fishermen are homeless. On Cape Cod and in the smaller fishing ports of Massachusetts and Connecticut, as well as on the coast of Maine, the fishermen, as a rule, own their own houses, marry young, and are surrounded by large families of children. As has been already said, their wives and daughters are usually well educated and refined in their tastes. Even on remote islands on the coast of Maine many of the fishermen's houses are comfortably and tastefully furnished. The walls are hung with engravings, and books and musical instruments are to be found. It is not at all uncommon to find a piano in the house of a fisherman. The earnings of the successful fisherman are almost always applied to the building up of a pleasant home for his family, and to the education of his children, for whom he almost always has the ambition that they shall be fitted to follow some other occupation than the one to which his own life has been devoted. This is true in the outlying ports as well as in the larger towns. It is amusing and seems incongruous, after making the acquaintance of a rough-looking old fisherman, sun-browned and weather-beaten, who looks as if he rarely put foot upon the shore, to be invited to his house, and to find him perfectly at home among the well dressed and gentle women of his family, surrounded by luxuries and conveniences which, three centuries ago, would hardly have been found in the palace of a king.

The old age of the fisherman is usually spent pleasantly in the home which his industry has established, his daily amusement being to visit the wharves and talk over the experiences of the past and discuss the doings of his successors.

Many of the sea-port towns of New England are made up, in large part, of the houses which have been reared by fishermen of the past or present generation.

Mr. Henry L. Osborne makes the following observations on the routine life of the Gloucester fishermen when on shore:

"UNLOADING THE VESSEL.—After the fisherman returns from a voyage he is not at once free, but must work for a few days in unloading the vessel's cargo. His first few hours ashore are very likely to be spent in cruising about to learn the news, and it is not improbable that he may take a few drinks with any old comrade whom he meets, while the two 'talk things over' and compare notes. He must, however, settle down to work not long after his return, because the owner is anxious to have the cargo brought to light, to have his vessel empty, and thus to be ready for any new and promising venture. The work of unloading usually takes two or three days, or even more in case of large vessels. When ready to begin operations, all hands, armed with pews, invade the hold, the deck, and the wharf, and pitch out the fish from the kenches in the vessel's hold.



Home of shore fisherman at Cape Ann, Mass.

From a photograph by T. W. Smillie.

From below the fish are thrown on deck; they are then thrown to the wharf, placed on scales, and weighed. It is the duty of all hands, except, I believe, the cook and the skipper, to help in this work. If the cook be a worthy one, he improves the occasion to clear out the fore-castle lockers, to wash up the pans, kettles, and other utensils, knives and forks, spoons and crockery, and, in short, to leave things after him in a decent state. If the vessel has ended her year's work and is ready to lay up for the winter, he will pack up the dishes and other kitchen furniture, clean up the galley stove and treat it liberally with oil to keep away rust, and will remove to the storehouse of the firm all of the ship's stores that have not been consumed. The skipper's duty is to direct the unloading of the fish, a labor in which he may possibly bear a hand, though I believe he is not obliged to. The work proceeds, enlivened by stories and small talk and occasional potations of beer and other liquors, until all the fish are out of the vessel. All hands are then free to do as they please, and, after drawing their pay, may ship for another trip, or may depart, never to be seen again.

"In some cases a man may not care to unload a cargo, or at least to do his share in the unloading. In such a case he is allowed to hire some one to do this portion of the work. A man may be sick when the vessel gets in, or having so much money coming to him, may feel too lazy to work; or he may find a chance to ship, and, not caring to lose it, engage a substitute to do his work. Hence the practice of hiring substitutes to work in the unloading is not unusual.

"DRAWING PAY.—When the work of unloading has been finished the trip is considered at an end. The market value of the fish is then determined, and the proper share of each man is ascertained. The share of each man is at his disposal in the form of a check payable to bearer. Any money he may want to use before drawing his share is advanced by the firm, and subsequently deducted.

"THE BOARDING-HOUSE.—On reaching land after a trip the fisherman's first move, if unmarried or without a home at Gloucester, is toward his boarding-house. Here his arrival is unannounced, yet its suddenness creates but little surprise, because such things are every-day matters. His ambitions for the time center themselves in putting on some clean clothes and then in getting a thorough renovation at the hands of a barber.

"These boarding-houses are sailor's institutions. They are similar to the sailor boarding-houses which exist in every seaport town, yet in morality they are higher than these, nor are their owners such incorrigible rascals. The price of board varies from \$3 to \$6 per week, and at the latter price very good fare is furnished. The boarding-houses vary greatly in their reputation. Some are pleasant, home-like places of good character; others are dingy and tumble-down houses, and in many cases of a not altogether enviable reputation.

"By the more careful, the board bill is paid at frequent intervals, before it can become large. In other instances it is allowed to run until it has grown to an important amount. In such cases the fisherman often loses all track of its amount and he is then placed at the mercy of his boarding-master. If the boarding-master be dishonest, he may liberally increase the amount of the bill in defiance of detection, for the cheated man has no means of defending himself. In this way the fisherman is very often imposed upon, sometimes knowing nothing of it, and at others knowing it, but unable to protect himself.

"TRUSTEEING.—In order to protect the boarding-masters, lest the fisherman depart without paying his bill, a practice exists in Gloucester known as trusteeing. It is, in effect, attaching for the debt the proceeds of the fisherman's trip. A practice similar to this, called "factorizing," by which the factory hands are forced to pay their bills, exists in factory towns. The necessity is quite evident for such a law in Gloucester to protect honest boarding-house keepers against dishonest guests. It would seem that a law to protect the fishermen might also be a wholesome

thing. I am informed that the boarding-house keeper cannot trustee for small amounts, it being regarded as unjust that the fisherman should pay the lawyers' fees, unless the suit be an important one.

"AMUSEMENTS.—During his stay on shore, after the vessel has been unloaded, the fisherman's life is an aimless hunt after excitement and new forms of amusement. A few days are enough to tire him utterly of land and shore doings and he is looking again for a new chance. During these leisure days his day-time when not at meals is spent in visiting the wharves, sail-lofts, various stores of the firm-owners, and similar places. There he meets others of his vocation and with them talks of the deeds of the past or the prospects for the future. With them he may go to some not far distant bar-room where they can compare notes over their beer. At these times a circus or any similar excitement is gladly welcomed.

"SEEKING A NEW BERTH.—In his pursuit of pleasure ashore the fisherman always seems somewhat ill at ease and anxious to get back to his work. Almost as soon as he is free from one trip he begins to look about for another. If his vessel is going out again as soon as she unloads, he may stay by her.

"MAKING READY FOR A NEW TRIP.—Having shipped for his new trip the fisherman's life again presents to him a definite object. The vessel must be put in order for her voyage: the sails, when they are not strong enough, must all be renewed; old ropes, too weak for a blow, must be replaced by others; new gear must be provided for use in case of emergency; complete outfits of hooks, gangings, and other elements of trawl structure must also be laid in; as well as all sorts of odds and ends that may be needed during a long absence.

"There is salt to be procured and stowed in the various compartments of the vessel's hold, and the water barrels must be filled. The cook, meanwhile, must busy himself about the various stores needed for the crew during the entire time of absence. He must draw from the store of the firm flour, tea, sugar, molasses, pork, lard, fish, cheese, candles, salt, and kerosene, and a thousand articles, convey them on board, and stow them away all safely below.

"Each man has stowed in his bunk his bed-sack and other belongings, and all hands on deck present to Gloucester Harbor the familiar sight of stout forms hoisting the huge mainsail, heaving up with a monotonous click, click, at the windlass. Now her bow falls off from the wind, the mainsail draws, the other sails are quickly set, and she soon leaves Gloucester far behind."

41. LIFE ON BOARD THE VESSELS.

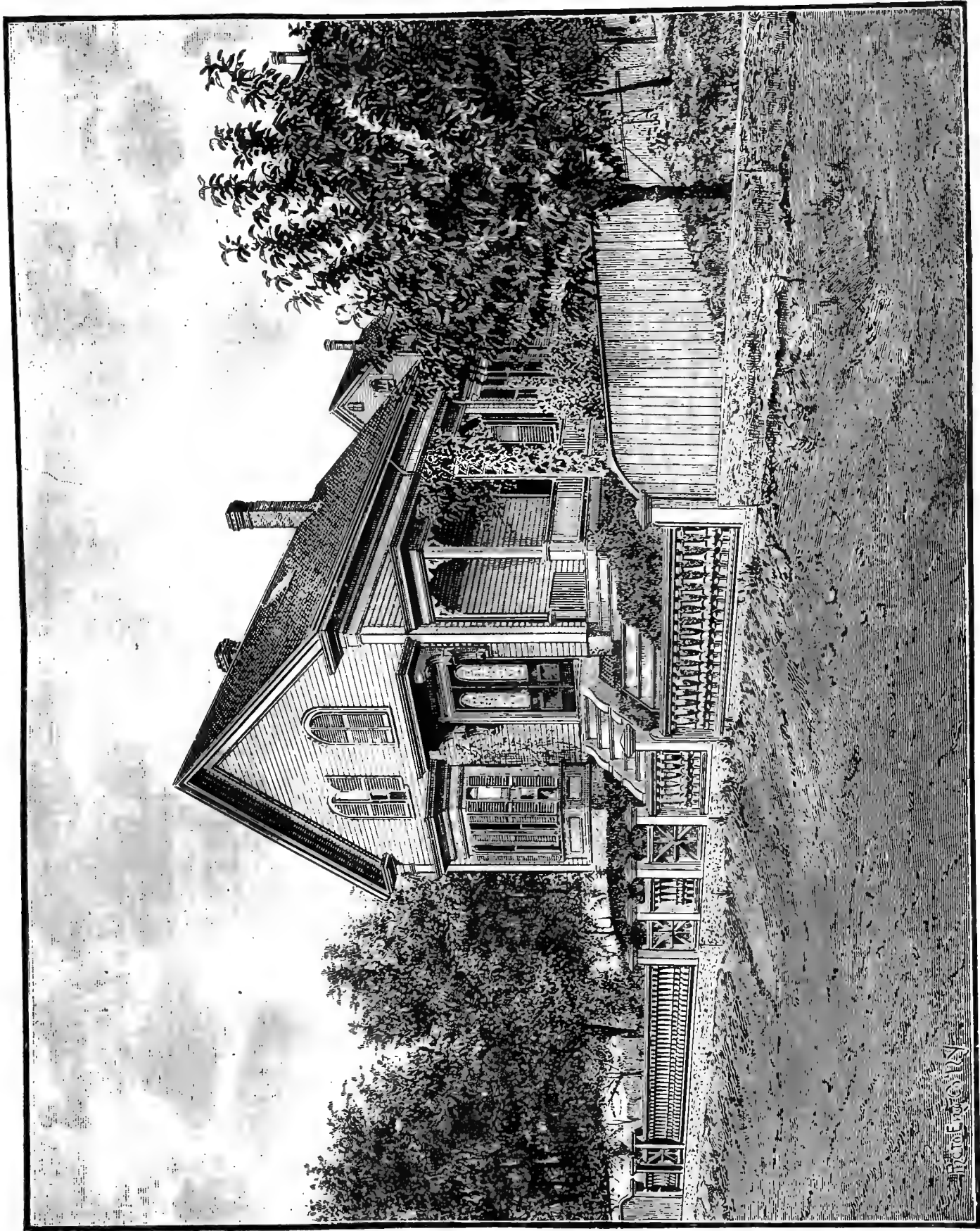
The life of the fishermen on board their vessels is so well discussed by Mr. Henry L. Osborne that little more need be said concerning it. By reading his descriptions, one may form a very vivid and accurate mental picture of the life of the fishermen. Mr. Osborne's notes were collected during a trip to the Grand Bank in the cod-fishing schooner *Victor*, of Gloucester, in the summer of 1879, in behalf of the United States Fish Commission.

Mr. Osborne discusses the subject under three heads: (a) Routine of daily life on the Banks; (b) Pastimes on board ship; (c) Routine of life at baiting stations.

"ROUTINE OF DAILY LIFE ON THE BANKS.

"MEALS.—As soon as the first indications of daylight were noticeable in the east, the cook would emerge from his berth, rake up his fire, which he never permitted to go out, and proceed to prepare for breakfast. At 4 o'clock, or not far from that hour, he announced the meal by a blast with his whistle, a summons which was usually obeyed with somewhat of tardiness.

"Dinner was usually ready at 11 o'clock, though never much earlier. Sometimes it inter-



Home of haddock and mackerel fisherman, at Gloucester, Mass.

From a photograph by T. W. Smillie.

rupted the work of cleaning the fish. In this case the men washed the gurry off their clothes and hands and sought the table. As a rule, the dinner was announced after one gang of cleaners, at least, were done; these would then wash up and go below. In this case, some from each table would sit down together, those properly belonging to the second gang occupying the place of the absentees of the first division.*

"The supper was usually served about half past 3 or 4 o'clock, coming directly after the trawls had been baited up for the night-set. The men, if they wore the oil-skin suits in 'baiting up,' did not take them off before sitting down to the table.

"In addition to three regular meals, two very definite informal meals were provided, besides slight lunches at all times. It was a fixed habit with the men to proceed below to 'mug up' the instant they came aboard from a haul or set. At evening, when he came on board from setting the trawl, the fisherman invariably went at once to the dish-locker and took from it one of the brown earthen mugs. This he filled from the tea-pot, which the cook had left partially full of tea from supper. Then turning to the provision-locker, he extracted thence bread, pie, cake, or meat, according to his fancy and the state of the larder. From these he made a very enjoyable meal, talking meanwhile with those who were going through the same operations in their turn. This 'mugging up' was also regularly practiced in the morning after the return from a haul.

"One might expect that the food of the fishermen, especially when fishing, would consist quite largely of fish. I had expected that it would be so, but found nothing of the sort. Only once a week did the cook furnish fish, and that was on Friday, which was quite natural, since nearly all hands were Catholics. The fare of the fishermen is far better than one would suppose who has heard stories of the poor living of other sailors. They live far better than any other class of seafaring men, and have provisions of a better grade and in greater variety.

"FISHING.—After they had finished breakfast, the crew at once got ready their dories and, embarking, pulled away toward their outside buoys. This was usually just about sunrise; very often, indeed, when the day was clear the dories were away from the vessel before the sun came up. When the weather was foggy—and it was foggy almost all the time during July and August—the skipper was occupied, during the absence of his men, in blowing a horn and ringing a large bell which hung from the main-boom, just over the wheel-box, to guide the men in their rowing, and upon occasion he used to fire off a swivel to let them know the vessel's position.

"The haul usually occupied the time till nearly 8 o'clock, sometimes longer, when any one failed to find his outside buoy or 'parted,' or was overtaken by any other accident to his trawl. After the dories had come back and were unloaded the crew 'mugged up,' and then dressed the fish and salted them down in the hold. This usually kept them leisurely at work until toward 11 o'clock, at which time they 'washed up' and went to dinner.

"After a brief respite they began to make preparation for baiting up the trawls for the evening's set. Any who had their trawls snarled took this occasion for 'clearing' them; others, more fortunate, forgot their troubles in sleep. By 1 o'clock or thereabouts all hands were turned out by the skipper's 'Well, boys, let's bait up,' and ere long all were industriously at work getting bait from the pens, chopping it into pieces of the proper size or fastening it to the hooks.

"While the men thus occupied themselves, the cook improved his time by 'cutting out' sounds. This business our cook pursued assiduously, often snatching a few moments from his work before dinner to cut out sounds while the crew were 'dressing down,' and finishing his task while they were baiting, and his assiduity repaid him when he reached Gloucester to the extent of an additional \$20. After supper, which was purposely placed early, the dories were hauled up from the stern, where they had been left fastened since morning, and loaded up with the trawls, five tubs

in each. Then the men jumped into them and pulled strongly away, each in his own direction. After their departure, the vessel was again left vacant. The only sound to be heard at this evening hour was the scrape, scrape, scrape, thud, thud of the cook's knife, or the tramp of the skipper's boots as he paced the quarter-deck for exercise. The men usually finished setting and returned to the vessel just at sunset. The dories were hauled on board, the men took the bearings of their buoys, and then all was done for the night.

"WATCHES.—The watch on the bank was only kept at night, and was much shorter than when the vessel was on a passage. It was usually set from 7 or 8 o'clock in the evening until 3 the following morning, or later, when the sun rose later during the last baiting. A single man kept the deck during his portion of the watch, then called his successor. The password in those times used often to contain directions as to the proper care of the vessel. Each man was expected to pump the vessel out at the end of his watch, on blowy nights; one of his duties was to watch the cable and 'fleet the strad in the hawse-pipe,' if necessary; that is to say, veer out the cable a little to prevent it from being chafed and parted.

"The watch was not always very strict in the performance of his duty. He made frequent excursions into the cabin to consult the clock, and to assure himself that he was not losing track of the flight of time. Indeed, it is said that the men sometimes regulated the clock during their watch so that the man of the last watch found the dawn breaking much later than usual.

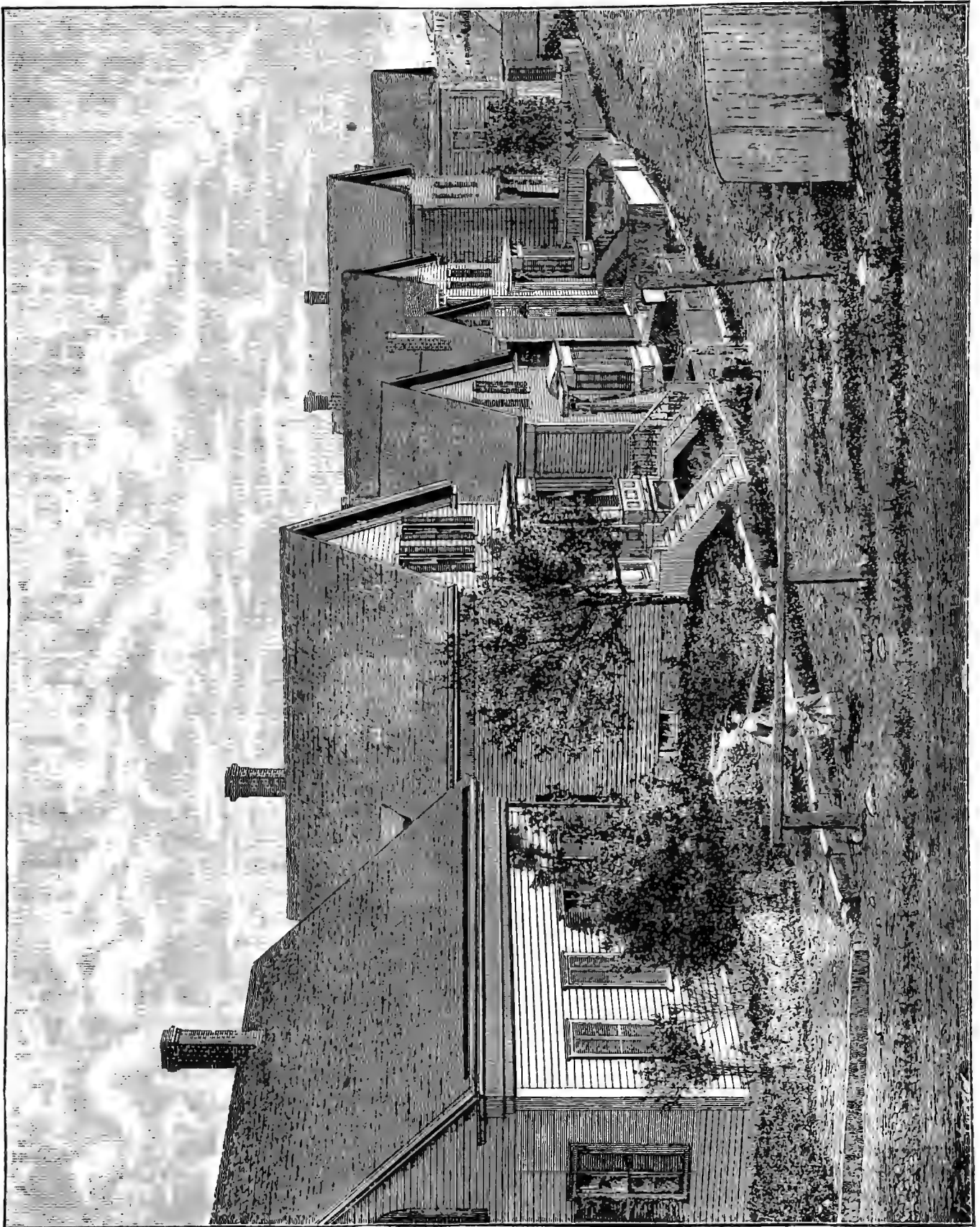
"LIGHTS.—In the evening, as soon as it began to grow dark, the cook lighted a large lantern, with convex lenses on four sides, and hung it in the fore-peak halyards. This was the only light used to warn off vessels: the red and green lights were used only when the vessel was running.

"BLOWY DAYS.—Sometimes we had 'blowy days.' All day and all night long the wind would whistle through the rigging and the sea become so rough that even the stanch dories could not be trusted over the side. On such days fishing was interrupted. If the trawls were out they must remain till the wind moderated. The men did not seem to enjoy their enforced leisure at such times. Meals were served at more suitable hours than during moderate weather, and they slept much; the sense of ennui seemed overpowering.

"PASTIMES ON BOARD SHIP."

"CONVERSATION.—The fishermen, for the most part, passed their spare time, of which they had abundance, in idling. In order to break up the monotony of silence they talked a very great deal on various subjects.

"At such times a good story-teller was a great blessing, and even one of poor grade was willingly listened to. All sorts of short stories circulated, also Irish bulls, witty retorts, &c., and a good story was usually greeted with hearty laughter. Among the stories told one might frequently hear those of which the morality was unquestionable, yet it was noticed that when a smutty story was told it was partly excusable, since it was usually irresistibly ludicrous. Indeed, in some cases stories were begun in which the principal point lay, not in fun, but in filth, and these were growled down by more than one of the hearers. Narratives of personal adventure were also in great demand. Those who had been in the merchant service; who had sailed to foreign shores, and who could acceptably describe these scenes or tell of their adventures, were heard with a great deal of interest. One fertile topic of discussion was the oppression of sailors, particularly in the merchant service. Instances of ill-treatment were often told, and the conduct of the captain roundly condemned. When the maltreated sailor came off first best the expressions of satisfaction from the listeners plainly indicated the side with which they sympathized. The oppressions of the boarding-house keepers were also examined into, and to have left one of these



Fishermen's homes at Gloucester, Mass.

From a photograph by T. W. Smillie.

houses without paying one's bill was thought very praiseworthy. Among the narratives of personal adventure there were a great many stories of conquests among the fair sex, especially of flirtations and intrigues in the various harbor-ports frequented by fishermen.

"In addition to these were yarns, often listened to with close attention by a crowd collected forward or down aft. The story would often be merely the adventures of some sailor or the plot of some robber story of dime-novel circulation. Sometimes the hero was placed in the first person, or, in other words, the story-teller represented the adventure as his own. More often, however, they belonged to an imaginary hero, who was invariably called Jack: sometimes the supernatural powers were invoked, thus adding to the complication of the plot. Among their stories fairy tales had a place: I noticed several that I recognized, notwithstanding their new dress, as nursery tales told to me when I was a boy. In all these tales the imagery was such as a fisherman author would imagine. It was homely; comforts were those regarded by him as such, and beauties were those which were beautiful to him. Thus, in a version of *Beauty and the Beast*, the father, all tired and wet, was led into a warm kitchen, where a dry suit was hanging before the fire ready for him. He was then conducted into a warm dining-room where he found a good supper of beef-steak awaiting him. After supper he 'turned in.' In all the fairy stories Jack used to slay the dragon, and, after he had exposed the deceits of his rival, all hands made a triumphal march to the church, where he was married happily to the king's daughter.

"MUSIC.—Somewhat akin to yarn-spinning was ballad singing, which, however, was less frequently indulged in, since singers were scarce, while any one could tell a story. The song was always a solo, and the words, in the form of a ballad, the story of some shipwreck, of sailor-life, or of some kindred subject, to which they listened intently.

"CARDS.—As might be expected, one of the favorite pastimes was cards. On the evening of the very first day out from Gloucester, as I made my way forward to the knight-heads, I found a group of six playing 'forty-five.' They paid five cents each for the privilege of playing, and then the man who made forty-five points first won the stakes. Later during the cruise the game of 'loo' began to create a great stir and for several nights the players continued their game far into the night. This was however effectually opposed by the other inhabitants of the fore-castle, who were unwilling to have their slumbers disturbed. Various other games of cards prevailed at various times, and among them cribbage seemed quite a favorite. Card-playing, however, finally died out from the fact that the cards became utterly worn out and no other pack could be procured.

"ROUTINE OF LIFE AT BAITING STATIONS.

"FILLING WATER.—While in harbor the fisherman's duties are extremely light and his time is left almost entirely free for any form of diversion that may suggest itself. Any work that in the vessel's economy may need doing he must, however, perform. One of these duties is the replenishing of the water supply. As often as the vessel goes to land all the barrels are overhauled and the empty ones are filled. This process, known as 'filling water,' was performed several times by our crew. I remember it most distinctly at Cape Broyle on the occasion of our first visit. We anchored at two or three o'clock well up the harbor and not far from a shelf of rock, over which a pure mountain stream ran down into the sea. This stream dropped down from the rocks above in a small cascade and furnished nice water and a convenient place for filling the barrels. Soon after the anchor had been let go and the sails snugged up for a short stay, the skipper gave out the order to bring up the water barrels and 'fill water.' Two or three barrels were then put into each of the three dories and the men then rowed away to this natural reservoir. It so chanced that the men forgot to bring a funnel with them from the vessel. Any one else in this condition would

have been in trouble, but a fisherman generally can extemporize a very good one. When they reached the stream and were ready to begin filling the barrels, one man drew off his oil-skin trousers and crumpling up one leg at the bottom, introduced it into the bung-hole. He then held up the leg of the trousers, while bucket after bucket of water was poured in, and found its way into the barrel. This stream and many others like it running from this natural spout and thus easy to catch are found in the various coves and harbors that indent the shore line of Newfoundland, and the places where they occur are known among bankers as 'good places to fill water.'

"**TAKING IN ICE.**—Another duty of the fisherman while in harbor is the care of the ice, which is used in preserving fresh bait. In some cases the vessel can be hauled up to a wharf and the ice brought down in wagons and slung on board with very little trouble, but often this cannot be done, because of the shallow water in the harbor, and it is then necessary that it should be brought aboard in dories. When our vessel iced at Trinity Bay the dories were all sent ashore and beached out of reach of the swell which would have otherwise kept them too unsteady. The ice was then taken from the rude wagon in which the dealer drew it to the shore, carried to the dories and packed in them. The men handled the ice, for the most part, without tongs, their hands being protected by mittens, and carried the huge blocks in their arms. As each dory was loaded it was shoved off and rowed to the vessel. Coming alongside, the ice was slung on board with a tackle and dropped into the hold, where it was received by men and stowed in the ice-pens.

"**ICING BAIT.**—A third duty of the fisherman, at this time, is to care for all the bait which is brought on board, icing or salting it as the skipper directs. I presume that all kinds of bait are treated alike, but my personal observation relates only to the squid as iced at Trinity Bay. When some thousands had accumulated, several of the crew 'oiled up' and prepared to 'ice' them. The labor was divided and operations began. One gang brought blocks of ice from the ice-pen, passed them to the deck and into one of the huge tubs used in splitting. The tub was placed during this operation on the quarter-deck, just aft the main shrouds, and the squid usually lay in one or more piles somewhere near the tub of ice.

"Two men stood by the tub and each one began with his pew to pick the ice into small pieces. After it had been reduced to the proper size, it was thrown into a basket and passed through the after hatch into the hold. Here it was received by a second man who passed it into the bait-pen to a third, who, receiving the basket, emptied the ice on the floor of the pen and spread it evenly in a layer 3 or 4 inches thick. When he had thus covered the bottom of the pen, he called for squid. A layer of squid was now spread over the ice followed by another layer of ice. In this way four or five baskets of ice and squid were alternately laid down until at last the bait was all iced. The man in the bait-pen handled the bait and the ice with mitten-covered hands, standing on the floor till the layers of ice and squid rose too high for convenience and afterward he stood on the bait.

"It was the regular practice to ice at night all the bait which came on board during the day. Several times the bait came to us so fast that by noon as many as 5,000 had accumulated. When this happened all hands would turn to and ice them, also icing in the evening those received later.

"**VISITING, STROLLING, &C.**—As soon as the vessel is anchored and properly cared for one of the first things is to go ashore and 'take stock.' Soon a dory may be seen leaving the vessel's side. One or two men are rowing and the others are grouped in the bow and stern. Rowing toward one of the rude wharves that line the shore, they all scramble up, and, making the dory fast, spread out over the town, generally in little knots of two or three. In accordance with the habit of Newfoundlanders, they enter any house that may seem attractive, and without any introduction proceed at once to talk of the fish, the bait, their trip, or kindred subjects of mutual interest.

They are very likely to ask if milk can be bought there, or where they can buy it. Quite often something stronger than milk is asked for, and wines or gin or red rum are drunk. None of our men became intoxicated to excess, though two or three came aboard in a pretty jolly condition. Sometimes the men did not go into any of the houses, but contented themselves by talking to the men they met on the street, or strolled around the town or into the outskirts, noting the people and the houses.

"DANCES.—One of the favorite pastimes of a crew, while 'in baitin,' is a dance. So often have they had these dances in Newfoundland that one of the first questions that a 'livier'* puts to a new-comer is, 'Are you going to get up a dance?' Usually they hire the house of some native, and when they have no fiddler in the crew hire some one to fiddle. They then summon all the girls in the place by a general invitation. The crew, during our cruise, went to several dances, two of which they got up themselves. At Bay of Bulls, on our last baiting, they decided to have one of these dances, and secured a most miserable house for this purpose. There was no fiddler, but only a boy who sang for them, or, according to the Newfoundland vernacular, made 'chin-music.' The reports from the party on the following morning made me anxious to see one of those dances, and I was therefore glad to hear talk of their having another one.

"I went into the room—the living-room of the house—in which the dancing was to take place. The ball had already opened. The room was one of the poorest I had yet seen, even in Newfoundland. The uneven floor was utterly barren of carpet, mats, or any covering. A shaky, crazy-looking lamp on one wall threw a dismal light about, and showed the crew and about eight girls seated on benches that lined the wall. In the immense fire-place sat the mother of the family, holding in her arms a baby of two years. When I entered, the host was leading off with an opening break-down. His unwieldy movements as he tried the double-shuffle in his heavy cowhide boots were very grotesque. The orchestra furnished 'chin-music.' The musician was a young man who hummed in a sort of grunting nasal tone various tunes of proper time for square dances. It is utterly impossible to describe the sound which this musician produced; it was a succession of nasal tones in the key of C. The minstrel was at intervals inspired by such words as these, 'That's it, Thommy, me b'y, gi' de bies a tune,' and kindred exhortations. Their dances were all the square dances, and generally the well-known lancers. The various figures were called off by one of the crew. The sailors apparently enjoyed themselves just as well as if the music had been very much better. They paid the old man a couple of dollars for his house, gave the sweet singer a fee, and were finally on board the vessel at about four o'clock in the morning."

42. PUBLIC SERVICES.

SERVICES IN TIMES OF WAR.—The importance of the fisheries to the prosperity of nations has frequently been alluded to by the writers who have taken this subject into consideration. In Sabine's "Report on the Principal Fisheries of the American Seas"† numerous instances are given in which the fishermen of the United States have rendered important services of this kind.

The people of Marblehead, Gloucester, Salem, Beverly, and other fishing ports of New England were among the foremost to meet the enemy in the Revolutionary war. The privateers which played so important a part then and in the war of 1812–1815 were largely manned by fishermen, especially those from Newburyport.

"The services of the people of Marblehead," says Sabine, "are entitled to particular notice. They were invaluable upon the sea and upon the land. When, in 1774, the port of Boston was

* A resident of the Newfoundland coast is, in fishermen's dialect, a "livier."

† Pages 198–210.

shut by act of Parliament, they tendered to their suffering brethren of the capital the use of their wharves and storehouses free of charge. The first actual avowal of offensive hostility against England which is to be found in the revolutionary annals, is an act passed by the Provincial Congress of Massachusetts in November, 1775. It was framed by Elbridge Gerry, a merchant of Marblehead, whose business depended upon the fisheries. It authorized captures upon the sea. With its preamble it was printed in the London Magazine as a political curiosity, and John Adams calls it 'one of the most important documents in the history of the Revolution.' Who 'hoisted the first American flag?' and to whom 'the first British flag was struck?' are questions in dispute between the friends of different claimants; but Mr. Adams confers both honors upon John Manly, of Marblehead, who captured a transport having on board a mortar, which, transferred to Dorchester heights, 'drove the English army from Boston, and the navy from the harbor.' The fishermen of this town appear to be entitled to the same precedence in naval affairs under commissions authorized by the Continental Congress, since it is stated that John Selman and Nicholas Broughton were the first commanders appointed by Washington after he assumed the direction of affairs. Another commander of merit was Mugford, who took a powder ship early in the war, and perished in the enterprise. And still another was Samuel Tucker, who, successful beyond his compeers, is said to have captured more British guns and British seamen than Paul Jones, or any other captain in the service of the thirteen States. Of the exploits of individuals of humbler rank, two examples must suffice. In 1783 'three lads' were put on board of a brig at Quebec to be sent prisoners to England; on the passage they gained possession of the vessel and carried her safely to Marblehead, their native town. The same year three other young fishermen—all minors—prisoners in the British ship *Lively*, conceived the plan of capturing her, and, inducing ten other prisoners to join them, were successful; and, conducting their prize to Havana, made sale of her for a large sum.

"For service in the field Marblehead raised one entire regiment. It has been remarked of these 'fishermen soldiers' that, inured to fatigue and hardship, they were not reduced by sickness or camp diseases during the war. This regiment composed a part of the force of the illustrious commander-in-chief in his retreat through New Jersey, and in the crisis of the Whig cause. The American army, composed of regulars and militia, hardly three thousand in number, almost destitute of tents and utensils for cooking, badly armed, nearly naked and barefooted, dispirited by losses and worn down by sufferings, were pursued, in November and December, to the northerly bank of the Delaware, by the well-appointed army of the enemy, flushed by success, and panting for a last decisive victory. For a moment the destruction of Washington, either from the waters in front or from the royal troops in rear, seemed certain. The heroic daring of the men who, perhaps, saved him, and with him their country, is nowhere related in history. But Henry Knox, the chief of artillery, whose own services on the occasion will ever be remembered and excite admiration, has done them justice. After the peace, and while General Knox was a member of the legislature of Massachusetts, an application was made by citizens of Marblehead for the charter of a bank. Their petition was opposed. He rose and stated their claims. 'I am surprised,' he said, 'that Marblehead should ask so small a privilege as that of banking, and that there should be opposition to it. Sir, I wish the members of this body knew the people of Marblehead as well as I do. I could wish that they had stood on the banks of the Delaware River in 1777, in that bitter night when the commander-in-chief had drawn up his little army to cross it, and had seen the powerful current bearing onward the floating masses of ice which threatened destruction to whosoever should venture upon its bosom. I wish, that when this occurrence threatened to defeat the enterprise, they could have heard that distinguished warrior demand, 'Who will lead us on?' and seen

the men of Marblehead, and Marblehead alone, stand forward to lead the army along the perilous path to unfading glories and honors in the achievements of Trenton. There, sir, went the fishermen of Marblehead, alike at home upon land or water, alike ardent, patriotic, and unflinching whenever they unfurled the flag of the country."

Starbuck, in his history of the American whale fishery, gives the following glowing tribute to the public service of the whalers of this country :

"Few interests have exerted a more marked influence upon the history of the United States than that of the fisheries. Aside from the value they have had in a commercial point of view, they have always been found to be the nurseries of a hardy, daring, and indefatigable race of seamen, such as scarcely any other pursuit could have trained. The pioneers of the sea, whalers, were the advance guard, the forlorn hope of civilization. Exploring expeditions followed after to glean where they had reaped. In the frozen seas of the north and the south their keels plowed to the extreme limit of navigation, and between the tropics they pursued their prey through regions never before traversed by the vessels of a civilized community. Holding their lives in their hands, as it were, whether they harpooned the leviathan in the deep or put into some hitherto unknown port for supplies, no extreme of heat or cold could daunt them, no thought of danger hold them in check. Their lives have ever been one continual round of hair-breadth escapes, in which the risk was alike shared by officers and men. No shirk could find an opportunity to indulge in shirking, no coward a chance to display his cowardice, and in their hazardous life incompetents were speedily weeded out. Many a tale of danger and toil and suffering, startling, severe, and horrible, has illumined the pages of the history of this pursuit, and scarce any, even the humblest of these hardy mariners, but can, from his own experience, narrate truths stranger than fiction. In many ports, among hundreds of islands, on many seas the flag of the country from which they sailed was first displayed from the mast-head of a whale-ship. Pursuing their avocation wherever a chance presented, the American flag was first unfurled in an English port from the deck of one American whaler, and the ports of the western coast of South America first beheld the Stars and Stripes shown as the standard of another. It may be safely alleged that but for them the western oceans would much longer have been comparatively unknown, and with equal truth may it be said that whatever of honor or glory the United States may have won in its explorations of these oceans, the necessity for their explorations was a tribute wrung from the Government, though not without earnest and continued effort, to the interests of our mariners, who, for years before, had pursued the whale in these uncharted seas, and threaded their way with extremest care among these undescribed islands, reefs, and shoals. Into the field opened by them flowed the trade of the civilized world. In their footsteps followed Christianity. They introduced the missionary to new spheres of usefulness, and made his presence tenable. Says a writer in the *London Quarterly Review*: 'The whale fishery first opened to Great Britain a beneficial intercourse with the coast of Spanish America; it led in the sequel to the independence of the Spanish colonies.' * * * 'But for our whalers, we never might have founded our colonies in Van Diemen's Land and Australia—or if we had we could not have maintained them in their early stages of danger and privation. Moreover, our intimacy with the Polynesians must be traced to the same source. The whalers were the first that traded in that quarter—they prepared the field for the missionaries; and the same thing is now in progress in New Ireland, New Britain, and New Zealand.' All that the English fishery has done for Great Britain, the American fishery has done for the United States—and more. In war our Navy has drawn upon it for some of its sturdiest and bravest seamen, and in peace our commercial marine has found in it its choicest and most skillful officers. In connection with the cod-fishery it schooled the sons of America to a knowledge of their own strength, and in its protection developed and

intensified that spirit of self-reliance, independence, and national power to which the conflict of from 1775 to 1783 was a natural and necessary resultant."

The Boston Journal of Commerce of January 25, 1879, in speaking of some of the old whalers sunk in Charleston Harbor during the late war between the States, gives the following account of the capture of one of them from the British :

"The *Corea* came from England during the Revolution, bound for New York with army stores. Putting into Long Island in a storm, a small vessel with nearly one hundred fishermen put out to capture her, and, with only four men and a boy on deck, anchored on the fishing grounds, and were apparently busy fishing when a gun from the *Corea* summoned her crew to run down to her, and when alongside a part of the crew were made to bring their fish on board. While the English sailors were looking at their prize one of the fishermen threw some fish on the schooner's deck, and the armed men swarmed up from the hold and on board of the *Corea*, which was taken to New Bedford, and eventually became a whaler."

During the war of the rebellion the Navy of the North, as has already been stated, received large accessions from among the fishermen of New England. Two or three companies of infantry were recruited at Gloucester, the members of which were chiefly fishermen.

Capt. F. J. Babson, collector of customs for the port of Gloucester, gives the following concise statement of the relation which Gloucester has held, and still holds, to the United States as an element in its system of coast defenses: "For the defense of the Union in the late war it is estimated that fifteen hundred men went into the service from Gloucester, two-thirds at least being seafaring men or fishermen. The availability of fishermen for offensive war on a foreign nation must be computed on the privateering basis. At least fifty swift-sailing steamers for privateering could obtain crews in Gloucester in one week, while service in the regular Navy is not, and never will be, popular with our people. Our men desire chances for promotion, such as is possible in the volunteer service in the Army, and the country, if she ever fights, must fight a war of the people, by the people, and for the people."

There is an almost complete lack of statistics showing to what degree our fishermen rendered service during the late war. It may be taken for granted that fishing towns furnished their full quota to the Army for these wars, no distinction in the drafts between mariners and landmen, while all of them contributed a greater or less number of men to the naval forces of the north. Most of the men entering the Navy, as well as a large number of those who joined the Army, were volunteers. The extent to which fishermen were employed in the Navy is not understood, even by persons, not residents of fishing communities, who profess to be well informed on such matters. The fishermen usually went to large recruiting stations, such as those in Boston or New York, and no record was made of their former occupation. After the war had closed, scarcely a fishing vessel sailed from Gloucester or any other large fishing port which had not in its crew several veterans.

The following account of the resistance of a whaling captain to being captured by the Confederate privateer *Shenandoah*, as recorded in the newspapers of the time, serves to illustrate the dogged determination and courage of a New England whaleman.

Capt. Thomas G. Young, of the *Favorite*, of Fairhaven, a man between sixty and seventy years old, who had all his property invested in his vessel, loaded his bomb guns and other weapons and took his stand on top of the cabin of his doomed vessel, and, when the *Shenandoah's* boat came alongside, drove her off by threatening to fire upon her. Captain Waddell, of the *Shenandoah*, ordered his gunner to train a gun on the *Favorite* and fire low; but Young's subordinates, having in vain

tried to dissuade the old hero from resistance, removed the caps from his guns, and, taking a boat, pulled off to the Shenandoah. Another boat was sent alongside and the officer in charge hailed the old man and commanded him to surrender.

The brief dialogue which now took place was too full of seaman's expletives to be repeated in this place. Captain Young defied the privateersmen, in the most emphatic words, and as the men boarded his ship he leveled his huge bomb-gun and pulled the trigger; but the piece, which had been tampered with, failed to explode and he was soon made a prisoner.

FISHERMEN EXEMPTED FROM TAXATION IN COLONIAL TIMES.—When the colonies of Massachusetts and Virginia were established, it seems to have been the intention of the English Government to encourage in every possible manner the establishment of fisheries; in fact, one of the chief objects of the Massachusetts colonies in seeking a station so far north upon the coast was evidently to gain increased facilities in the prosecution of this industry.

In the early history of the Massachusetts colonies may be found numerous acts whose direct purpose was to encourage men to engage in the fisheries. Many of these provide for the exemption of fishermen from military service. The following law is recorded as having been passed:

"At the Generall Courte, houlden at Boston, the 22th of the 3th M^o, called May, 1639." "All fishermen, while they are abroad during fishing seasons, shipcarpenters, w^{ch} follow that calling, & millers shall bee exempted from training, yet they are to bee furnished with arms."*

Again we find another act passed:

"Att a Gennerall Courte held at Boston, 14 of October, 1657." "In answer to y^e peticōn of Edw Rainsford, Gamaliel Waite, John Shawe, Mathew Abdy, Richard George, John Peel, Richard Hollige, Richard Woodhouse, Robt Linkhorne, Abell Porter, Peter Till, Abraham Browne, Jn^o Mellowes, fishermen, humbly desiring that they may be exempted from traynings during time of the fishing season &c, the Court grants their request."†

HUMANE SERVICES.—Important services are constantly being rendered by the fishermen in the way of rescuing vessels and men in peril. The medal of the Massachusetts Humane Society has frequently been awarded to fishermen, and in several instances valuable gifts have been received by our fishermen from foreign Governments, especially from Great Britain, for services rendered in saving the lives of British subjects. A long chapter might be devoted to recounting instances of heroism, where lives have been saved by our fishermen at great risks to themselves by acts of daring, which scarcely any but men like our fishermen, thoroughly accustomed to the sea, would have dreamed of attempting.

It is a well-known fact that fishermen habitually take extraordinary risks in rescuing their shipmates, or others, in peril. Whittier has unintentionally done a great injustice to the New England fishermen by the implications expressed in his poem, "Skipper Ireson's Ride":

Small pity for him! He sailed away
From a leaking ship in Chaleur Bay—
Sailed away from a sinking wreck
With his own townspeople on her deck.
"Lay by, lay by," they called to him.
Back he answered, "Sink or swim,
Brag of your catch of fish again!"
And off he sailed through the fog and the rain!
Old Floyd Ireson, for his hard heart,
Tarred and feathered and carried in a cart
By the women of Marblehead.

* 1639. The legislature of Massachusetts passed an act to free from all duties and public taxes all estates employed in catching, making, or transporting fish. All fishermen, during the season for business, and all ship-builders were, by the same act, excused from trainings. [Hutch., I, 92.] Holmes' American Annals, 1805, vol. i, p. 312.

† Records of Massachusetts, vol. iv, Part I, page 312.

As a matter of justice we print in a foot-note what is doubtless a true review of the facts of the case; it appeared in the *Marblehead Statesman*.*

* SKIPPER IRESON.

Many a time when traveling away from his native heath the writer has met individuals whose only knowledge of our good old town was that gained from reading the poem of Mr. Whittier which is the theme of this article. When the formula of introduction had proceeded far enough to announce that we were from Marblehead, the reply has too often come, "Oh! yes, Morble'ead, where old Flud Oirson for his hord hert was tar'd and feathered and corrid in a cort." So often has this been repeated that there grew within us a feeling of exasperation, and the very name of Whittier had an unpleasant sound. This experience gave us the firm resolve that, if opportunity ever offered, we would place upon record the protest of one Marbleheader against the libel upon his native town and the insult upon the fair fame of her noble women. We have been forestalled in our original design by the publication of the true story of Skipper Ireson's ride, by Mr. Samuel Roads, jr., in his "History and Traditions of Marblehead." Immediately upon the publication of the history by Mr. Roads, the poet sent him a letter, in which he gracefully acknowledges the truth of the story as told by Mr. Roads, and bears testimony to the honorable record of old Marblehead. Mr. Roads's story is as follows:

"On Sunday, October 30, 1808, the schooner *Betty*, commanded by Skipper Benjamin Ireson, arrived from the Grand Banks. Shortly after their arrival the crew reported that at midnight on the previous Friday, when off Cape Cod light-house, they passed the schooner *Active*, of Portland, which was in a sinking condition, and that the skipper had refused to render any assistance to the unfortunate men on board the wreck. The excitement and indignation of the people upon the reception of this news can be better imagined than described. Two vessels, manned by willing volunteers, were immediately dispatched to the scene of disaster, with the hope of their arrival in time to save the shipwrecked sailors. But their mission was a failure, and they returned with no tidings of the wreck. The resentment of the people was still further provoked when, on the following day, the sloop *Swallow* arrived, having on board Captain Gibbons, the master of the ill-fated schooner. He corroborated the story told by the crew of the *Betty*, and stated that the *Active* sprung a leak at about 11 o'clock on Friday night. An hour later the *Betty* was spoken, 'but, contrary to the principles of humanity,' she sailed away without giving any assistance. On Saturday, Captain Gibbons and three of the passengers were taken off the wreck by Mr. Hardy, of Truro, in a whale-boat. Four other persons were left on the wreck, but the storm increased so rapidly that it was found impossible to return to their rescue. Captain Gibbons was placed on board the revenue cutter *Good Intent*, and afterwards went on board the sloop *Swallow*, in which he came to Marblehead.

"This statement, by one who had so narrowly escaped a watery grave, made a deep impression upon the fishermen, and they determined to demonstrate their disapproval of Skipper Ireson's conduct by a signal act of vengeance. Accordingly, on a bright moonlight night, the unfortunate skipper was suddenly seized by several powerful men and securely bound. He was then placed in a dory, and, besmeared from head to feet with tar and feathers, was dragged through the town escorted by a multitude of men and boys. When opposite the locality now known as Work-house Rocks the bottom of the dory came out, and the prisoner finished the remainder of his ride to Salem in a cart. The authorities of that city forbade the entrance of the strange procession, and the crowd returned to Marblehead. Throughout the entire proceeding Mr. Ireson maintained a dignified silence, and when, on arriving at his own home, he was released from custody, his only remark was, 'I thank you for my ride, gentlemen, but you will live to regret it.' His words were prophetic. When too late to make reparation for the wrong they had committed, the impulsive fishermen realized that they had perpetrated an act of the greatest injustice upon an innocent man.

"At this late day, when for years his memory has been defamed throughout the land, and the fair name of the women of Marblehead has been sullied by the fictitious story of one of our best New England poets, it is but just that the true story of the affair should be written. Skipper Ireson was not more to blame than his crew, and, it is believed, not at all. When the wreck was spoken and the cry of distress was heard, a terrific gale was blowing. There was a consultation on board the *Betty* as to the course to be pursued, and the crew decided not to endanger their own lives for the sake of saving others. Finding that they were resolute in their determination, Skipper Ireson proposed to lay by the wreck all night or until the storm should abate, and then go to the rescue of the unfortunate men. To this they also demurred, and insisted on proceeding on their homeward voyage without delay. On their arrival at Marblehead, fearing the just indignation of the people, they laid the entire blame upon the skipper. This version of the affair is generally accepted as true, and for the credit of the town, be it said, that it is one of the few incidents in its entire history that its citizens have any reason to regret."

Mr. Whittier's letter is as follows:

"OAK KNOLL, DANVERS, *Fifth-month*, 18, 1880.

"MY DEAR FRIEND: I heartily thank thee for a copy of thy 'History of Marblehead.' I have read it with great interest and think good use has been made of the abundant material. No town in Essex County has a record more honorable than Marblehead; no one has done more to develop the industrial interest of our New England seaboard, and certainly none have given such evidence of self-sacrificing patriotism. I am glad the story of it has been at last told, and told so well. I have now no doubt that thy version of Skipper Ireson is a correct one. My verse was solely founded on a fragment of rhyme which I heard from one of my early schoolmates, a native of Marblehead. I supposed the story to which it referred dated back at least a century. I knew nothing of the particulars, and the narrative of the ballad was pure fancy. I am glad for the sake of truth and justice that the real facts are given in thy book. I certainly would not knowingly do injustice to any one, dead or living.

"I am truly thy friend,

"JOHN G. WHITTIER."

Numerous instances of humane acts by fishermen are on record; a volume could be filled in their narration, and we quote here two or three as examples of many:

About the year 1863 a fishing schooner, commanded by Capt. Thomas Dench, of Gloucester, encountered a heavy gale on George's Bank, in which she was driven from her anchorage and met with some damage, losing among other things a boat. Soon after the gale began to moderate, and while yet the sea was very rough, she fell in with a British vessel in a sinking condition. Not having any boat, it was a problem how the fishermen could succeed in rescuing the imperiled crew. This they did by taking some of the ice-house planks which were in their vessel's hold and nailing them to the bottom of a gurry-pen.* With this imperfect boat they succeeded in rescuing the crew from the sinking vessel and brought them to Gloucester. For this humane and daring act, performed under such difficult circumstances, the captain was awarded a very fine telescope by the British Government.

The following paragraph, from the Cape Ann Advertiser, April 22, 1881, gives an idea of the nature of the rescues which are frequently made:

"A DARING DEED—TWO GLOUCESTER MARINERS RISK THEIR LIVES TO RESCUE A COMRADE.—The two men who went from the schooner *Star of the East*, Captain Dowdell, to rescue Albert F. Fitch on Brown's Bank on the 3d instant, as narrated in our last issue, were Michael Doyle and Joseph Hackett, and they are deserving of great credit. Fitch was washed overboard while engaged in dressing fish, the schooner being at anchor upon the Bank, and was fortunate enough to catch hold of a shifting plank which was washed overboard, on which he succeeded in keeping afloat for an hour and ten minutes before being picked up. [This is probably an error in regard to time.] It was blowing a heavy gale from the northwest, with a strong tide running to leeward, and any attempt to go to his rescue was fraught with great peril. But, unmindful of the serious risk, Doyle and Hackett jumped into an old dory and started away before the wind and sea to rescue their imperiled comrade. After they got him on board of their frail boat they found it absolutely impossible to return to their vessel, but succeeded in boarding the schooner *Joseph O.*, which was also lying at anchor on the Bank. It took some three hours of constant labor, after arriving on board the *Joseph O.*, to resuscitate Fitch, and the three men remained on board the latter vessel from Sunday night until Tuesday afternoon, when the *Star of the East* was signaled and ran down and took the men on board."

The Cape Ann Advertiser, of the same date, also contains the following note:

"RECOGNITION OF BRAVERY.—Collector Babson has received the sum of \$150 from the Massachusetts Humane Society, to be handed over to the crew of the fishing schooner *Laura Sayward*, of this port, for their heroic conduct in rescuing the crew of the British schooner *Maggie Blanche*, in the midst of a furious gale on George's last September. Two of the crew, James Lord and Dean Crockett, who went in a dory and took off the captain and mate of the *Maggie Blanche*, who were lashed to the wreck, will also receive the medals of the society. It will be remembered that the men named have also received handsome watches from the British Government in recognition of their bravery. The *Maggie Blanche* was bound from Digby to Barbadoes; her owner, who was on board, and two of her crew, were drowned. The master, Capt. John C. Winchester, and mate, Thomas Lewis, were lashed to the deck when the wreck was discovered by the *Laura Sayward*. Capt. James Moore, master of the latter vessel, finding that the wreck was likely to sink before the men could be rescued, promptly cut his cable to allow his vessel to drift, and Crockett and Lord put off in a dory, at the risk of their lives, and succored the imperiled mariners."

* A gurry-pen is an oblong pen on the deck of the vessel, usually 12 feet by 4 or 5 feet, and without any bottom, which is secured to the deck by lashings. In this is put the offal of the fish, or fish-gurry, while the vessel is on the Bank.

43. COSTUME OF THE SAILOR-FISHERMEN.

Fifty years ago the costume of our fishermen was similar to that of the average European fishermen of the present day. Indeed, among the early records of the Plymouth colony we find mentioned a number of articles of fishermen's clothing sent over by the English capitalists who interested themselves in the development of the fisheries. A writer in the "Fisherman's Memorial and Record Book" describes the dress of the Gloucester fisherman in the olden time as follows: "It consisted generally of the tarpaulin hat and monkey-jacket or Guernsey frock (sometimes both); the barvel, a stout apron of leather, and the ponderous fishing boots, of astonishing breadth of beam, made of the thickest of russet cow-hide, with tops turning up high over the knees, which, though cumbrous and heavy, constituted an efficient protection against cold and wet."

The fishing dress chiefly in use at the present time is much lighter, more comfortable, better fitting, and better made than that worn by any other class of sea-faring men, except by sailors in the Navy and on yachts. At the Fishery Exhibitions at Berlin and London were exhibited a number of garments of rubber and oiled cotton which excited much interest. Not only was the excellence of the material a subject of general remark, but patterns of these garments were requested by public officers interested in introducing them into use in the fisheries and naval marine of Norway, Russia, and Germany. The contrast between the American clothing and the heavy leather garments shown in the Norwegian, Danish, German, and Dutch sections was very striking.

The dress of the fisherman at the present day, with the exception of waterproof articles, consists of trousers, waistcoat, and coat of some woolen fabric. The coat is, however, very frequently replaced by a monkey-jacket or reef-jacket of a heavy woolen fabric, and, in warm weather, a jumper, or loose jacket of calico, gingham, or wool, similar to that worn by butchers. Their under-clothing is nearly always of some stout wool, and their feet are covered with woolen socks. The ordinary coverings for the feet, when the men are off duty in the cabin, or when on deck in warm weather, are heavy leather slippers. The head covering is generally a wide-awake or slouch hat of felt, though every kind of hat or cap seen on shore is used upon the fishing vessels. A close-fitting cap of dogskin or lambskin, with flaps for protecting the face, ears, and back of the head, was formerly commonly worn in cold weather. This cap is still occasionally used in winter, but a broad-brimmed hat of felt, chip, or straw is in more general use in pleasant weather.

The outer garments of the fisherman, worn when he is at work, are put on over his ordinary clothing. Since they are peculiar in shape they will be described separately:

Oil trousers and jacket.—The trousers are made very large and are provided with an apron which covers the entire front of the body with a double layer of cloth, extending high up on the chest and held in that position by straps passing over the shoulders. It has wings or flaps extending back upon each side of the hips, which are buttoned or tied with a string at the front of the waist.

The oil-jacket is a double-breasted garment, shaped much like a pea-jacket. It has upon the right-hand side an extra flap, called the "weather piece," which buttons over the flap on the left side, thus effectually excluding the water. The collar is about three inches wide at the back and is intended to stand up and button closely around the neck. These are sometimes lined with flannel.

The sou'wester.—This is a hat of the ordinary sou'wester pattern. There are several shapes in use among our fishermen. The Cape Ann sou'wester is regarded by the fishermen as better than any other.

The jumper.—This is a light oil-cloth garment shaped like a shirt, but with the smallest

possible opening at the neck and buttoning closely round the wrists. It extends down to the hips and is worn outside of the trowsers. This is worn instead of the oil-jacket in warm weather, especially by men dressing fish.

The barvel.—This is a stout apron of oil-cloth. The barvel is made in different shapes: (a) the barvel proper, which is an apron of heavy oil-cloth, extending from the waist downward to below the boot-tops, and upwards, in a flap, almost to the neck, and is held in that position by a strap passing around the neck. The flaps almost meet at the back and are held in place by two strings which cross each other at the small of the back, passing around the body and fastening in front. It is generally used in place of the "pants," especially when cod fishing in summer, and sometimes when dressing fish, and is occasionally worn in connection with the jumper or the jacket; (b) the petticoat barvel, which is in general form like the ordinary barvel, but has a much larger flap, closed at the back and extending under the arms. It extends higher up on the waist than the ordinary barvel. This has but recently come into use among our fishermen, but is essentially the same as the garment worn centuries ago by the French and English fishermen in the Newfoundland and Labrador fisheries. These fishermen used to stand inside of a barrel when dressing fish, and the petticoat hung over the outside. The petticoat barvel is chiefly in use among the hand-line fishermen and the seiners.

Oil-sleeves.—These are false sleeves fastened tight about the wrist and extending high up on the arm, generally secured at the shoulder with a button. They are used by the men while dressing fish and hauling the seines or engaged in any other work in which the arms are likely to get wet.

Monkey-jackets and mufflers.—There is comparatively little difference in the temperature on the fishing grounds in summer and winter, especially on the distant grounds where cold fogs constantly prevail, and where, as the fishermen express it, the year is made up of nine months' winter and three months late in the fall. The monkey-jacket is substituted in the coldest weather for the jumper, and sometimes both are worn together. The only special provision for comfort is a woolen muffler, or comforter, with which the neck and face are enveloped.

Boots.—Fishermen's boots are either of leather or rubber, the latter material being in more general use in winter, while leather is chiefly worn in summer. Ordinary rubber boots, costing from \$3.50 to \$5, are commonly used. The hip boots are sometimes, though not frequently, worn. Among the Bank fishermen boots of russet leather are preferred to the black ones, but whether red or black, the leather fishing boots are generally of thick cowhide or "grain-leather," with very heavy soles.

Quality of oiled clothing.—The oil-clothes made in New England are acknowledged to be the best in the world. The oil is applied with more skill, the materials are better, and the patterns the most convenient. Both double and single thickness of oil-cloth are used, the latter chiefly in summer. All of the garments described, except the barvels, are also made of rubber, and are frequently used by the fishermen. These wear longer and are preferred in winter because they do not stiffen or crack in cold weather; the price, however, is considerably higher. The cost of a jacket and "pants" of oil-cloth, in 1880, was from \$3 to \$3.50. A corresponding suit of rubber costs about \$10.

HAND COVERINGS.—A variety of coverings for the hands are in use:

(a) *Woolen mittens.*—These are made of coarse yarn. Inappropriate as it may seem, they are almost always white, colored mittens being considered by some fishermen unlucky or "Jonahs." The more liberal fishermen respect the prejudices of their companions. These mittens are used not only for warmth but as a protection to the hands when dressing fish. They are always

washed after the work of dressing the fish is finished. Men going on a long cruise provide themselves with several pairs of these mittens. They may be bought in the shops for about 50 cents a pair, but are often made by members of a fisherman's family.

(b) *Cotton mittens*.—These are similar in shape to the woolen mittens; they are made of pieces of cotton drilling sewn together, and, like the woolen mittens, are white. They are used principally for dressing mackerel in the summer season and handling the seines, being cooler and more comfortable in warm weather than those made of wool. The cotton ones cost about 25 cents a pair.

(c) *Rubber mittens*.—These are sometimes lined with flannel, and when not so lined are made very large in order to fit over the ordinary woolen mittens. They are used to a limited extent by the winter fishermen and cost about \$1 a pair.

(d) *Oil-mittens*.—These are usually made of stout cotton drilling and oiled. They are used in the same manner as the unlined rubber mittens, being worn over woolen mittens. They cost about 50 cents a pair.

(e) *Mackerel gloves*.—These are made of woolen yarn and resemble mittens, except that the forefingers have separate coverings. By this arrangement greater freedom of motion is allowed to forefingers of men who are eviscerating or "gibbing" the mackerel.

(f) *Hand-haulers*.—These are tight-fitting gloves of woolen yarn, with long wrist pieces, extending half way up the forearm, and very short finger and thumb stalls. These are used by the hand-line fishermen in the winter, being worn with the nippers, described below. The short finger-stalls are supposed to facilitate the free use of the fingers in baiting the hooks. The hand-haulers are not sufficiently common to be kept for sale in the shops.

(g) *Nippers*.—These resemble wristlets in general appearance, but are worn around the lower part of the fingers instead of around the wrist. They are knit of woolen yarn and, like the mittens, are always white. They are used by all trawl and hand-line fishermen, but not by mackerel fishermen. They are held in the hollow of the hand, when the line is being hauled, for the sake of greater ease in obtaining a grip. They are stuffed with woolen cloth in such a manner that there is a narrow crease in the center between the two edges, by the friction of which the hand is aided in its effort to retain a grasp upon the line. Nippers are for sale in all the shops, and cost 50 cents a pair. Unlike all the other articles of clothing and hand wear, the nippers form part of the outfit of the vessel and are included in the "stock charges," of which the crew pay one-half. The only exception to this rule is the usage, which occasionally prevails, of giving a suit of oil-clothes, at the expense of the vessel and crew, to an expert "salter" for his services on a Bank trip. A halibut vessel, expected to be absent from port about six weeks, carries from a dozen and a half to two dozen pairs of nippers, and the Grand Banker carries a still larger supply, sometimes four or six dozen pairs. Large quantities of nippers are made by the fishermen's widows at Gloucester, to whom this industry affords a partial support. These women also knit some of the mittens, though the greater part come from the maritime districts of Nova Scotia and Maine. Nippers are also made by the young ladies of seaboard towns for sale at church fairs.

(h) *Finger-cots*.—These are separate finger-stalls of rubber or wool worn by mackerel fishermen upon the forefinger when hand-lining for mackerel. They are kept in the shops and cost about 5 cents or 10 cents apiece.

CARE OF CLOTHING.—The fisherman's wardrobe is seldom stored in chests or trunks. The number of men living in the cabin and the forecastle renders it unadvisable to fill up the space with furniture of this description. The skipper, however, sometimes carries a chest, or "donkey," as the fishermen call it. The oil clothes, which form the bulkiest portion of the fisherman's dress, of which he carries two or more suits, cannot be stowed away in a confined space, but are always

hung up in some convenient place. If they were put away wet they would mold, and if dry they might heat and ignite; above all, it is necessary that they should be ready for use at a moment's notice. Each member of the crew has his own nails or hooks upon which his oil clothes are always hung. The act of donning the oil-skin suit is called "oiling up." Every man carries from two to five changes of clothes, which he stows away in a canvas bag called a "clothes-bag." Convenience, as well as the fisherman's prejudice against valises, causes this custom to be almost universally observed. The bag is about 18 inches in diameter and from 3 to 4 feet long, and is stowed in the back part of the berth. Some men use it for a pillow.

BED-CLOTHING.—Another part of the fisherman's outfit, which may properly be considered in connection with his wardrobe, is his bed-clothing. This includes a mattress, or, more generally, a sack of a coarse hempen fabric stuffed with straw, called a bed-sack. In Gloucester these are kept in the outfitting stores and are furnished by the owners and charged to the men; when filled and ready for use they cost \$1.25. The other bed-clothing, furnished by the men themselves, consists of blankets or quilts, of which each man carries one, two, or more. The pillows are stuffed with feathers or straw, and are provided by the men. When a man changes from one vessel to another he carries with him his clothes-bag, his bed-sack, and his bed-clothing; hence the common expression which is used to describe the man who is leaving a vessel and who is said to "jerk his straw."

SHORE CLOTHES.—The clothes which the fishermen wear on shore are in no way peculiar. The better classes in Gloucester live at home or in their boarding-houses; and after returning from a trip they cast aside their vessel clothing, and appear well dressed and well behaved.

44. FOOD ON THE VESSELS.

Mr. Osborne gives the following list of stores carried by a Grand Bank cod schooner with a crew of twelve men setting out for a three months' cruise:

Beef.....	barrels..	5	Coffee.....	pounds..	15
Pork.....	do.....	1	Condensed milk (cans).....	dozen..	4
Pigs' knuckles.....	do.....	1	Onions.....	bushel..	1
Butter.....	pounds..	200	Potatoes.....	do.....	10
Lard.....	do.....	150	Beans.....	barrel..	1
Flour.....	barrels..	8	Dried apples.....	do.....	1
Rice.....	bushel..	1	Dried peas.....	bushel..	1
Oatmeal.....	do.....	$\frac{1}{2}$	Essence of lemon (bottles).....	dozen..	2
Indian meal.....	pounds..	20	Raisins.....	boxes..	4
Hard-tack crackers.....	barrel..	$\frac{1}{2}$	Pepper.....	pounds..	2
Corn-starch.....	papers..	12	Salt.....	bags..	3
Saleratus.....	pounds..	5	Mustard.....	pounds..	2
Baking powder (packages).....	dozen..	4	Cloves.....	do.....	1
Hops.....	pound..	1	Ginger.....	do.....	2
Brown sugar.....	pounds..	350	Cassia.....	do.....	1
Molasses.....	barrel..	1	Sage.....	boxes..	4
Tea.....	pounds..	20	Nutmegs.....	pound..	$\frac{1}{2}$

In connection with his discussion of life on board the vessels, Mr. Osborne speaks of the manner in which these articles are prepared for the table. He writes: "From a glance at the list of provisions it is evident that, in the hands of a good cook, there is no reason why the crew should not be provided with excellent fare. The table on board the vessel was very good indeed; the lack of fresh provisions was felt, but the bread and the butter, and, in fact, the fare generally, was far better than that of the Provincials in the ports where we landed. I was surprised to find the fishermen living so well, and spoke of it, asking if it were generally so. In answer to this I was informed that on our vessel living was not better than the average, and that the crews of many

vessels fared far better, since, fishing upon grounds closer to the shore, they had more frequent chances of obtaining fresh provisions."

In former years fishermen did not fare so well as at present. Capt. Gideon Bowley, of Provincetown, made his first trip to the Grand Bank about the year 1828, in the schooner *Plant*. He gives the following account of the provisions carried by the vessel, and the routine of life on board while fishing on the Bank: "The schooner *Plant* was a topsail schooner of 63 tons O. M., carrying eight men and a boy-cook. The provisions for three months consisted chiefly of the following articles: 1 barrel of flour, 1 barrel of beef, $\frac{1}{2}$ barrel of pork, 20 bushels of meal, 16 bushels of potatoes; beans, dried apples, 1 barrel of molasses, 1 barrel of rum, 2 cords of wood for use in the fireplace, and 40 barrels of water. Sometimes they carried no flour, and then the larder was always supplemented by two or three barrels of rum. The vessel had a large open fireplace in the forecabin, in which over a wood-fire the cooking was done.

"The daily routine of meals was as follows: Breakfast at 7.30 a. m., consisting of brown bread, fish chowder, and tea and coffee, sweetened with molasses. When there was no fish the chowder was replaced by a dish called 'smotheration,' composed of potatoes and salt beef. Dinner at 12. We had sometimes soup, either made of salt beef with rice in it, pea soup or bean soup. Nothing under heaven but boiled beans. Brown bread, boiled potatoes, boiled beef twice a week, Wednesdays and Sundays (when there was beef enough). When there was no fish on the table there was something else, such as corned fish and potatoes, or fried fish. Supper at 6: brown bread and the fish or whatever else was left over from dinner."

Capt. Chester Marr gives the following description of the fare on board the fishing vessels of Gloucester about the year 1830: "The Gloucester fleet numbered about fifty boats, most of them 'Chebacco boats' or 'dog-bodies' and pinkies. The manner of living on board of the vessels was very simple; the food was mostly fish, no meat at all, and no soft bread; no butter nor sugar, nor knife or fork unless we carried them ourselves. Each man had a pan and a mug. We had black tea boiled in an iron kettle. We had our food in one tin pan, and each man had a spoon and we'd all sit round and eat our victuals out of it. We used to make our own matches out of pine wood and sulphur. I shall never forget the first time I went to the Bay of Saint Lawrence. A'ter I went on board I asked the skipper how long he had taken stores for; he answered, for about four months. When I got a chance I went down into the hold to see what he had, and this was what I found: 2 $\frac{1}{2}$ barrels of molasses, 16 barrels of hard bread, $\frac{1}{2}$ barrel of salt beef, $\frac{1}{2}$ barrel of pork; rice, potatoes, beans, pepper, and chocolate.

"This was for four months. We used to boil our chocolate with rice, in a sort of pudding. I never saw a bit of sugar on vessels for years—nothing but molasses. The whole outfit did not cost \$200. We lived just so to home as we did on board of the vessels, pretty much."

The fishermen of former days employed, as cook, a boy of from twelve to sixteen years, whose pay was almost nothing. On European fishing vessels the practice of having a boy for cook is still universal. The cook of New England vessels at the present day, on the contrary, is one of the most important men on board; with the single exception of the captain, he is the best paid man on the vessel, and is often given a "lay" that makes his remuneration quite equal to that of the skipper. He is therefore expected to be a skillful cook and a generally capable and reliable man, and to him is usually intrusted the responsible duty of naming the quantity of the provisions which he which he selects and takes on board for any given cruise.

All the members of a schooner's crew, from the captain to the smallest boy (if any boys are carried), eat at the one table, and fare precisely alike. The cook almost always decides what he

shall prepare for each meal, and if he be well qualified for his work the dishes are sufficiently numerous and varied to suit any but the most fastidious appetite.

Salted or corned meats are now always carried, though most vessels on leaving port take more or less fresh meat, and some which are engaged in market fishing have more fresh meat than any other kind. Hard bread is rarely or never used, except to make puddings. The "soft tack" made on the fishing vessels often equals in excellence the best bread that can be obtained on shore. Canned milk, eggs, fruit, and other delicacies are often carried.

There can be no question that fishermen, ordinarily, are provided with much better food than the people of the same class engaged in shore pursuits. To the improvement in the food is perhaps due the greater longevity of the fishermen, and the long period during which they may be actively engaged in a sea-faring life. The changes in the manner of fitting out the fishing vessels have been slow. It is said that the Marblehead and Beverly fishermen began the innovations by carrying extra supplies of provisions, the property of individual members of the crew. Sometimes every man would have his own butter tub and can of sugar on board. Gloucester has always taken the lead in improving the food of its fishermen, and, as early as 1850, vessels were fitted out from that port in much the same manner as at the present time. The introduction of canned provisions has been of great importance to the fishermen, and, of course, there is dissatisfaction at the change on the part of many of the older men, who think that their successors are indulging in needless luxury, and also on the part of some of the fitters upon whom falls a portion of the increase in the expense; such articles as milk and eggs are, however, paid for by the crew. There is, of course, some foundation for the feeling that the profits of the business are decreased by this more expensive style of living, but it is also true that men of the better class would not be willing to submit to the privations and hard fare endured by their predecessors.

The shrewdest fishery capitalists have satisfied themselves by experiment and observation that it is to their interest to provide their vessels with good provisions and a good cook, and to keep their vessels in the best of order generally, since by these means they secure good men, who are contented to remain in their service. Those firms in Gloucester which have a reputation for liberality have no difficulty in securing any men whom they may desire to have in their service.

One of the most striking changes is that ardent spirits are no longer supplied as a part of the outfit of the vessel. The history and significance of this change is discussed elsewhere.

On some of the smaller vessels of the New England coast, such as those employed in the shore fisheries of Maine, and many of the Boston market boats, the fare is probably little better than in the olden times. Some of the vessels are correspondingly antiquated in their rigging and outfit, and the fishermen retain many of the characteristics which have been referred to in connection with the offshore fishermen of olden days. The fishermen of France still live in the old way. Our vessels on the Grand Bank are sometimes boarded by the crews of the French bankers, who look upon them much as the hungry school boy looks upon the baker's shop. They eagerly ask for soft bread, which they consider a luxury.

The American fishermen undoubtedly fare better than any other class of sea-faring men, except, perhaps, the officers of merchant vessels.

45. DISEASES AND LONGEVITY.

DISEASES OF FISHERMEN.—The most common diseases among the fishermen of Gloucester are consumption, rheumatism, typhoid fever, and dyspepsia; but the pure air which the men breathe and their active lives save them from many of the ailments which are common upon shore. As might naturally be expected from the exposure to which they are subjected, consumption is the

most prevalent disease, but since they are well fed this disease is much less common than would be supposed. An experienced physician of Gloucester says that consumption is especially prevalent among young men under thirty-five years of age.

Colds are somewhat prevalent in severe weather, though many fishermen have the idea that if they go to sea with a cold it will disappear as soon as they get out of sight of land.

The occurrence of dyspepsia is accounted for, by one who knows, in the following manner: "Fishermen eat from three to five meals a day, and mug up between meals whenever they can get a chance, and in rough weather, when they are getting no exercise, they frequently eat a hearty meal and lie down immediately; this injudicious course results in many cases in chronic indigestion."

Rheumatism frequently results from exposure to cold and wet, and men who are engaged in packing fish in ice are especially liable to this complaint.

As is always the case on shipboard, there is much irregularity, and bowel complaints are very prevalent; and this also has its effect upon the health of the men. The dissipation into which some of the crews plunge when upon land has an injurious effect upon their constitutions, and breaks down many strong men.

Cases of nervous exhaustion are not at all uncommon, especially among skippers and fishermen who are ambitious for promotion or to become wealthy. This is particularly observable in the halibut fishery, in which the skipper, while making passages to and from the fishing grounds, is constantly watchful and wakeful for many days and nights, and sometimes does not remove his clothing for many days. The immoderate use of tobacco is believed, in some cases, to have aggravated the effects of such over-exertion. Strong young men, in this way, break themselves down in the course of three or four years, so that they are obliged to turn their attention to less arduous branches of the fisheries. The custom prevalent among cod fishermen on George's of fishing night and day in order to be "high line," or first in success among their shipmates, is also wearing in the extreme, and does not fail to tell upon the constitutions of those who practice it. The exhausting character of the halibut fisheries, indeed of the winter fisheries generally, may be judged of from the fact that men over forty-five years of age rarely engage in them except as masters of vessels, young blood and strong limbs being necessary; and those who have not succeeded in attaining to the dignity of skipper before reaching that age, having become exhausted by the arduous labors, seek either some other branch of the fisheries in which there is less hardship, or some employment on shore.

MEDICINES.—All the first-class Gloucester fishing vessels carry medicine chests, but the judicious use and proper condition of these depend upon the skipper, who usually administers any remedies which may be needed. These medicine chests are fitted up by reliable druggists in Gloucester, especially for the needs of the fishermen, and are accompanied by a book of instructions, by the aid of which any intelligent man can prescribe for the diseases to which fishermen are liable. Aperients, cathartics, purgatives, salves, and liniments are the remedies most frequently called for. Next to those come expectorants and other cough medicines. The only surgical instrument which accompanies the outfit is the lancet.*

* A typical medicine-chest was exhibited in the American sections at the International Fishery Exhibitions of Berlin and London. It is described in the catalogue as follows:

FISHERMAN'S MEDICINE-CHEST.—This chest is filled and ready for use. The contents are: 1, sulphur; 2, cream of tartar; 3, epsom salts; 4, arrow-root; 5, chamomile flower; 6, flax-seed; 7, flax-seed meal; 8, bicarbonate of soda; 9, Turner's cerate; 10, mercurial ointment; 11, basilicon ointment; 12, simple ointment; 13, glycerine ointment; 14, extract of paregoric; 15, extract of vitriol; 16, laudanum; 17, Fryar's balsam; 18, essence of peppermint; 19, spirits of niter; 20, balsam copaiba; 21, sulphuric ether; 22, syrup of squills; 23, soap liniment; 24, spirits of lavender; 25,

MARINE HOSPITALS.—There is no provision for the reception of invalided fishermen into hospitals. Vessels sailing under a fishing license pay no hospital dues, and so far as we can learn have no hospital privileges. In early colonial days New England fishing vessels were obliged to contribute to the support of the Greenwich Hospital in England, but this abuse was remedied in 1760 upon the representations of Mr. Fairfax, collector of Salem.*

The hospital at Halifax, Nova Scotia, affords a refuge to our fishermen such as they cannot find in any of our own ports.

DISEASES OF WHALEMEN AND SEALERS.—Scurvy appears to be the commonest disease among the crews of whaling vessels. This is caused by an excess of salt in their food, and usually begins to show itself about six or eight months after the vessel has left the home port. The principal symptoms of scurvy among the men belonging to the South Sea whaling vessels is in the swelling up and softening of the limbs of the sufferer. This disease affects the crews of whalers in the Arctic Seas in a very different way, the limbs of the sufferers turning black and shriveling in size. Scurvy often leaves sequelæ which render the victims lame for life.

The venereal disease is not unusual on whalers for a few months after a stay in port: This disease is rarely met with among the crews of the fishing vessels.

The sealing crews from Stonington and New London engaged in the capture of fur seals and sea elephants in the Antarctic, about Cape Horn, and in the Southern Indian Ocean, are subject to disease from exposure, and, worst of all, they are afflicted with scurvy. A veteran sealer tells us that in all his experience he never had his crew suffer from scurvy, because he required them to subsist largely on seal meat, which he considers a sure preventive of that disease.

In cases of sickness on board of whaling vessels the captain and mate have charge of the sick. Medicine chests are carried, usually larger than those on the Gloucester fishing vessels, and the patients are prescribed for by the aid of an accompanying book, which contains instructions sufficiently explicit to enable any man of intelligence to treat such sicknesses as ordinarily afflict men at sea.

LONGEVITY.†—In former days, when the mackerel fishery was carried on by hand-lining, it was not infrequent for boys to begin their fishing life at ten or twelve years of age, and two or three such were usually found on every mackerel vessel; but at present boys are rarely shipped until they have attained to manly stature and the age of fifteen or sixteen. A smart young man of American parentage is likely to have won his position as master before he is twenty-five years

spirits of camphor; 26, spirits of hartshorn; 27, tincture of rhubarb; 28, tincture of bark; 29, wine of antimony; 30, mercurial solution; 31, muriatic tincture of iron; 32, Seidlitz mixture; 33, castor-oil; 34, purging pills; 35, gum arabic; 36, blue pills; 37, opium pills; 38, fever powders; 39, calomel and jalap; 40, Dover's powders; 41, quinine; 42, ipecac; 43, calomel; 44, tincture of myrrh; 45, rhubarb; 46, magnesia; 47, Peruvian bark; 48, tartar emetic; 49, powdered cubebs; 50, nitrate of potash; 51, sugar of lead; 52, white vitriol; 53, blue vitriol; 54, tartaric acid; 55, red precipitate; 56, alum; 57, gum camphor; 58, iodide of potash; 59, lunar caustic; 62, lancet; 63, syringe; 64, the Mariner's Medical Guide. Gloucester, Mass., 1880.

* November 7, 1733.—A letter from the General Court to their agent, Francis Wilkes, in London, contains this passage: "Ever since the tax upon seamen called the six-penny duty for Greenwich Hospital has been required here there has been some uneasiness, but of late it has increased very much upon the demand of it from fishing vessels that go out a fishing and many times return at night, and never go to any other port, but return into the harbors of Marblehead, Salem, Gloucester," &c. Shortly before this time, William Fairfax, collector of Salem, summoned some of our fishermen for non-compliance with the custom. Suits against them were abated in our courts. Mr. Fairfax sent a representation of the matter to the British authorities. No further demand of the kind was made for the hospital money to 1760, as a Boston Gazette of that year certifies. Felt's Annals of Salem, vol. ii, 2d ed., p. 217.

† Mr. William Abbott, of Rockport, Mass., 94 years old, is very active and smart. He frequently goes out in his dory fishing, and into the woods nearly every day to bring out his burden of fire-wood.—Cape Ann Advertiser, April 15, 1881.

Capt. John Paine Havender, of Provincetown, has made fifty-eight voyages to the Grand Bank.—Gloucester Telegraph, April 16, 1870.

old, and in some instances by the time he is eighteen years of age. A man who has not become a skipper by the time he is forty-five years old is usually thrown out of the more arduous fisheries and seeks employment in those requiring less exposure and fatigue. Skippers, especially those engaged in the mackerel and summer-market fisheries, often retain their positions until they have attained a ripe old age: Capt. Chester Marr, for instance, over seventy years of age, and a great-grandfather, is still actively engaged in the summer fisheries, and Capt. King Harding, of Swampscott, who is one of the most successful masters in the well-known Swampscott market fleet, still holds his prominent position. It very frequently occurs, however, that a skipper after reaching middle age engages in some more lucrative employment on shore. If he has been sufficiently fortunate in his career as a fisherman to have laid up the necessary amount of capital he may become a vessel-fitter; otherwise he is likely to take some responsible position on shore in connection with the curing or packing of fish. It is estimated that not over 12 per cent. of the skippers of the Gloucester fleet are over fifty years of age. This is rather an exceptional case, for the fisheries of Gloucester are more arduous than those of other places. At Provincetown and some other ports there is a much larger percentage of elderly men in command of the vessels and among the crews. In talking with several elderly fishing captains of Provincetown we have gained the impression that the career of activity and usefulness is much longer now among fishermen than it was at the beginning of the present century. The Provincetown fisheries are not especially laborious or perilous, yet we are told that fifty years ago a man forty-five years old was considered aged and only fit to sit around on shore and chop kindling wood and perform other household tasks, while now a man of forty-five is regarded as in his prime. This, of course, may readily be accounted for by the difference in the character of the accommodations on shipboard and the better quality of the food which is now provided.* As regards the actual longevity of men who have engaged for the whole or part of their lives in the fisheries it is probably not less than that of men engaged in any other outdoor pursuits. In Gloucester one may find dozens of hearty old men who have spent thirty or forty years at sea, and similar instances may be found among the whaling captains of New Bedford and Provincetown; and especially is this true in the case of the retired fishing captains of Maine, of whom it is a common saying among their associates that "they never die until some one kills them." Even in Nantucket may still be found many veterans of the whale fishery so many years ago discontinued. Of course, in considering these facts, we must bear in mind that the general average of longevity has much decreased in consequence of so many fishermen having lost their lives by accident in the period of their greatest vigor and health.

46. THE FINANCIAL PROFITS.

DIVISION OF PROFITS.—In another section the manner in which the fishing vessels are fitted out is discussed, and the business arrangement or "lay" according to which the expenses of the outfit are divided and the proceeds of the year's work distributed. Here it is only necessary to speak of the manner in which the fishermen are affected by these various business arrangements and of their personal relations to the fishery capitalist.

The more extensive and more profitable the fishery, the more necessary and natural is the division of the persons engaged in carrying them on into two classes—the capitalists and the fishermen.

* In the opinion of Capt. Gideon Bowley, of Provincetown, in his youth men got unserviceable for sea after they got to forty-five years, and were thought old men. A man after forty-five could not get a berth on Bank vessels. Now they go up to sixty. After forty-five he staid at home, made fish and tended lobster pots. Capt. Bowley attributes this partly to the use of liquor. He has been on the Grand Bank when the vessel carried two barrels of Medford rum.

Prior to 1840 almost all the fishing vessels of New England were owned in large part by the fishermen themselves. In 1850, in the larger ports, like Gloucester, Portland, and Provincetown, the control of the vessels passed to a great extent into the hands of capitalists, or owners, as they are called. In the smaller ports, including most of those on the coast of Maine and Connecticut, the fishing vessels are still owned almost entirely by the fishermen themselves. In the whaling fleet the change has not been so radical. As might be supposed, this fishery has almost always been under the control of capitalists. The outlay for building and provisioning vessels so large and so long absent from port is ordinarily beyond the means of men who are willing to undergo the hardships of the fishery.

At present, the majority of the vessels engaged in the Grand Bank cod fishery, hailing from Provincetown, Plymouth, Beverly, and the ports of Maine, as well as many of those from Gloucester, are manned chiefly by fishermen who are hired by the trip or paid monthly wages. In all the other fisheries the crew, as a rule, "go upon shares," receiving at the end of the season (but in Gloucester, and occasionally in other ports, at the end of the trip) a specified proportion of the proceeds from the sale of the vessel's catch.

The universal adoption of this practice in Gloucester has had the effect of drawing from other ports many of the most capable of their fishermen. These men prefer to realize at once the amount which they have earned rather than to wait until the end of the season, becoming indebted to the capitalists for the supplies needed by themselves and families, thus placing themselves somewhat at the mercy of these men if they choose to be exacting. This is especially the case with the younger men, who want their money as fast as they earn it.

FISHERMEN'S EARNINGS.—The statistics of the Gloucester fisheries for 1879 show that the average earnings of each fisherman amounted to \$175. This amount, however, is below the average annual earnings, and does not give a fair idea of the amount that can be earned by a man in a year, or of the amount that is ordinarily earned by a successful fisherman.

In the "Fisherman's Memorial and Record Book" may be found the record of a large number of "big trips" in the George's mackerel and haddock fisheries. In many instances the share of each member of the crew is mentioned. In the Grand Bank halibut fishery for salt fish, in one instance, the vessel was absent twelve weeks, and the crew shared \$286 each. In another, after five months' absence, \$326; in another, after fourteen weeks, \$257 each.

Allusion is also made to "big trips" in the fresh-halibut fishery on the Banks. In one instance the "high line," or most successful of the crew, realized \$1,300 as his share of the year's stock; in another each of the crew shared \$858. On a single trip in 1871 the crew shared \$213 each, being absent five weeks, and on another, occupying nine weeks, \$363. In another instance, on a trip of thirty-four days, \$236; in another of twenty days, \$171; in another of four weeks, \$161.

The largest amount made by one man on a George's trip is recorded at \$243. These trips occupy from two to three weeks. Other instances are given where these trips yielded \$125 to \$160. The largest season's share mentioned was in 1865, when the "high line" made in the year \$1,105, and the cook \$1,402.

Much larger average shares have been made by successful mackerel men. Several instances are mentioned in which the "high-liner's" share ranged from \$260 to \$575 for a summer's work.

In the haddock fishery, occupying four or five months of the winter season, instances are mentioned where the crew shared from \$377 to \$560 each.

It should be stated that in all of these instances the profits of the skipper of the vessel, including captain's commission, are usually double the share of any member of the crew.

It will be seen, also, that men engaging in summer in the mackerel fishery, and in winter

in the haddock fishery, have an opportunity of making a yearly profit considerably larger than those mentioned.

The various cases just cited are, however, extraordinary ones, and the fishermen were regarded as unusually fortunate. A capable fisherman, with ordinary success, engaging in fishing at all seasons of the year, should make at least from \$300 to \$500. It is probable that the fishermen of those New England ports which do not engage in the winter fisheries do not, as a rule, make more than half as much.

The profits of the labors of the shore or boat fisherman are generally much less. In the winter shore fisheries of Provincetown, in some seasons, the fishermen pay out more for bait than the fish which they catch are worth. The price of clam bait at that port is \$6 per barrel, and, since a barrel will last a dory only two days it is evident that their fishing must be uniformly successful to insure them the slightest profit.

CREDIT SYSTEM.—In many fishing ports the fishermen become largely in debt to the men who supply them with boats, and provisions needed by their families while they are fishing, and they are often obliged to labor under considerable disadvantages. There is little evidence, however, that the capitalists are to blame for this, since they are quite as dependent upon the vicissitudes of the fisheries as the men to whom they supply the means of carrying on the actual work.

MARBLEHEAD FISHERMEN in 1834.—The financial condition of the fishermen of Marblehead in 1834 was described by a correspondent of the Marblehead Gazette, as follows:

“I promised to lay before your readers the reasons why fishermen of this town are unable to gain more than a bare subsistence by means of their laborious and dangerous occupation. Many of the young fishermen are addicted to gambling and other bad habits which reduce their circumstances. Not so with the older ones; they are an industrious and persevering class of men who endeavor, by all the means in their power, to gain a livelihood and be independent. These men have many obstacles to contend against besides those common to us all; they have to contend against the speculators on fish; these men often get the fish for one-third part less than they are worth, on account of their combining themselves and frightening some one of the shoresmen with a story respecting the low price fish will shortly stand at; or perhaps the shoresman is interested, and can make more money by selling part of the fish in his possession, thereby setting a standard price for others to sell at, and shortly after purchasing directly or indirectly the remainder and then speculating upon it. They also have to contend against enormous prices levied upon stores and provisions of all kinds for themselves while at sea, and their families at home. These, sir, are the causes why the fishermen of Marblehead are always poor. It is easily seen that if the speculator is successful in establishing his price that the fishermen will fare but poorly, as the speculator will not be contented with a small profit if he can have a larger one. I therefore advise the fishermen of this and all other towns to form societies for the purpose of protecting themselves. It is not a hard matter for them to gain the ascendancy, if they keep a bright eye to windward, and do not trust A, B, and C with the management of their affairs.”

C.—OFFICERS OF VESSELS; DISCIPLINE OF THE CREW; NAVIGATION.

47. OFFICERS AND DISCIPLINE ON FISHING AND WHALING VESSELS.

THE SKIPPER AND HIS DUTIES.—The fishing vessels of New England have practically only a single officer, the “master” or “skipper,” familiarly known to the crew as the “old man.” On some Cape Cod vessels, and also on some from the coast of Maine, one of the crew is known as the “first hand,” and is recognized as the person left in charge during the captain’s absence, though he otherwise has no authority. The skipper has the entire responsibility of the management of the vessel, and has absolute control of her movements. In the Gloucester fleet, and, with the exception already mentioned, all along the coast, the crew are on a footing of absolute equality, and, in case of accident to the skipper, some one is selected by common consent to take command during the remainder of the voyage. The skipper has no authority except that which his personal influence gives him and the deference which men accustomed to control instinctively command. He must be a natural leader, and generally gifted with superior intellect and tact, in order to get along with the crew, there being no special laws like those in the marine service, which give him authority over his men. In cases of insubordination he must have recourse to his physical strength. If he cannot sustain himself in this manner, his influence over the crew is gone. There have been many instances of vessels, commanded by the most skillful skippers of Gloucester, having been compelled to return home without completing their trip on account of insubordination, which the skipper could not overcome. Skippers naturally hesitate to come into personal conflict with their men, because by so doing they render themselves liable to arrest for assault and battery. The skipper is in every respect on an equality with the members of his crew, except when he is directing them in some kind of work, and the commands are usually given more in the form of a request than of an order. The cabin in which the captain sleeps and lives is shared by the crew, a part of whom sleep there, while all of them are at liberty to use it as a sitting-room when they choose; the skipper and the entire crew eat together in the fore-castle.

DISCIPLINE.—An excellent idea of the discipline on the Grand Bank cod vessels is given by the observations made by Mr. Osborne, in another part of this report.

On the whaling ships a strict system of organization is maintained similar to that in the merchant marine, except that it is even more formal and severe. The captain and his officers are secluded from the rest of the crew, occupying another part of the ship and eating by themselves. The captain has absolute control over his men, and is assisted in maintaining this control by his officers, of whom there are always from five to seven. The manner in which the whale ships are officered will be described elsewhere. On the sealers a similar system of discipline is kept up, though it is less formal, the vessels being smaller and the crew, since they are picked men and usually of American birth, are naturally more upon terms of equality.

It is easy to understand how the present system of officering the fishing vessels has grown up. The fisheries have grown in importance and the vessels have increased in size, while the customs of previous centuries have remained unchanged. Men who were neighbors on land and were engaged in the shore fisheries together would have no need of special officers or of special systems of

discipline. They fished on terms of perfect equality, and frequently any one of them was equally competent to take charge of the vessel in case of necessity. It is probable that in the early days of the New England fisheries vessels were often fitted out for the fisheries without the form of selecting any one to take charge. This, of course, could be the case only with very small vessels. As vessels increased in size, it became necessary for some one to be designated as the leader, but since it was usually the case that many or all of the crew owned shares in the vessel the position was not one of undivided responsibility. The position of master was often kept up simply to fulfill the requirements of the law, and the person occupying the position had no more actual authority than any other man on board. Traces of the old manner of doing things may still be found on vessels from some of the smaller New England ports. The Swampscott vessels, for instance, are to the present day usually owned by several members of the crew, and the master holds his position more as a matter of form and honor than on account of any particular responsibility which he assumes. Sometimes each member of the crew owns a share in the vessel in which he ships. Many of the Cape Cod vessels are managed in very much the same way. The captain always has associated with him two or three "sharesmen" who are members of the crew. These men usually own a part of the vessel or, at least, assume a part of the responsibility of fitting her out with stores and apparatus for a voyage. If they are not possessed of sufficient capital to assume this position on their own responsibility, they are supplied with capital by the actual fitter of the vessel, and the position is maintained in a fictitious manner. The "sharesmen" are, as a rule, unable to advance the money, and they are consequently obliged to obtain the fittings on credit from the capitalists or "owner," who undertakes the financial responsibility of the voyage.

In Gloucester and other large ports the influence of the old traditions is seen in the condition of the discipline on the fishing vessels. The members of the crew seldom have any pecuniary interest in the success of the voyage, other than their share from the sales of the fish. The majority of the skippers likewise are not directly interested in the vessel which they command, except so far as their share and percentage on the stock are concerned.

The fishermen have so little responsibility and interest in the vessel that they are accustomed to leave her whenever they choose. Some of the fishermen seldom make two trips on the same vessel, and it is not uncommon for parts of the crew to abandon their vessel when she is on the point of leaving port on a fishing voyage, even after the sails have been spread for departure. The success of fishing trips is occasionally materially injured by members of the crew leaving a vessel when she is obliged to touch at other ports during the progress of her voyage. The crew, under such circumstances, have the master of the vessel very much at their mercy, for it is against the law of the United States for a vessel to leave any of the crew ashore in a foreign port until they have been absent more than twenty-four hours, and they cannot therefore be considered as deserters. The master has but a limited power to compel his crew to remain on board, and they sometimes take advantage of this fact by going ashore at will, saying that if the master leaves them on shore he is liable to the penalty of the law.

The character of the master's authority has been already explained, but he is not supported in this by law. His only legal hold upon the movements of the men, when the vessel is at anchor in the harbor, is his power over the boats belonging to the vessel. These are the property of the owners and in his charge, and men taking them without leave may be prosecuted for stealing. About the year 1877 Capt. Dennis Murphy was prosecuted for damages by two of his crew, whom he had left ashore at Liverpool, Nova Scotia. They were not successful in their suit; the captain proved that they had taken one of the vessel's dories without leave and were therefore guilty of

theft. Notwithstanding the fact that they were unsuccessful, the suit cost the captain a large sum, probably more than his profits for the entire voyage, in addition to his loss of time.

Such instances of disobedience as the one referred to above are most liable to occur during the absence of the master from the vessel. He is, of course, obliged to attend to business upon the land, and, since he has no one on board to whom he can delegate his authority, the vessel is left without authority to enforce discipline.

The crew are supposed to sign shipping papers when they join the vessel, though many masters ship their crews without any formality whatever. These shipping papers, when signed, usually attach some penalty to absence from duty without leave, but the utmost penalty that can be inflicted is one which, within the memory of man, has never been enforced—that the fisherman's share in the proceeds of the trip shall be forfeited.

In cases where the American consuls at foreign ports have been appealed to for assistance in controlling an unruly crew, they have stated plainly that they had no authority in the matter. The difference in this respect between the fishing and whaling vessels is too evident to require comment. A severer system of discipline is needful no less at sea than on shore. Many of the fishing vessels are absent from two to six months, with crews of from ten to twenty-five men. It cannot be otherwise than that frequent necessity should arise for the exercise of authority to quell insubordination and to enforce proper attention to duty.

It is evident, from a consideration of the above facts, that there is need of a reform in the methods of officering the fishing vessels of the United States and maintaining discipline on board of them. On the smaller vessels the demand for a change of this sort may not be so strenuous, but even in these a different system of organization could result in no harm.

NEEDFUL REFORMS.—In the opinion of many of the most experienced fishing masters and fishery capitalists of Gloucester and other ports, the following changes would seem to be extremely desirable:

(1) More care in the selection of masters of fishing vessels. They should not only be required to pass an examination in seamanship and navigation, their proficiency to be attested and signed by a board of examiners, as in the case of the merchant marine, but they should be selected with reference to their good judgment, prudence, and humanity. Mere ability to obtain good "fares" of fish by some sort of haphazard luck should not be regarded as a sufficient recommendation for a man to whom are to be intrusted the lives of a number of men, and property worth several thousand dollars. The skippers of Gloucester vessels are frequently selected for no other reason than because they are supposed to have good luck, or, as the fishermen express it, because they are "killers." Luck of this sort is, of course, but little to be relied upon, and in the long run such men are perhaps less successful than their rivals who are skillful and observant.

(2) Since the needs of the fishing vessels are at the present day not very different from those employed in the the whaling and merchant marine, it seems evident that there should be more than one officer. There should be a mate, or first officer, who should share the responsibilities of the captain. He should have authority in the absence of the captain, and in case of accident to the latter should at once take charge of the vessel. This man should, of course, be subject to examination, like the captain, or, at any rate, should give evidence to the proper persons of his ability to perform the duties of his office. The creation of a grade of subordinate officers among the fishermen would undoubtedly have a good effect upon the whole body of men engaged in the pursuit. The number of responsible positions would be doubled, and the responsibility placed upon these men would render them more sedate and reliable. They would be recognized as in the line of promotion, and their efforts to improve themselves would be greatly stimulated. The advantage to the fishery

capitalists also would be very great, since they would be able to supply vacancies in the list of skippers from men who had been systematically trained for the position, instead of being obliged to select untried men at random from among the crews. At present the only means by which the owner can select a skipper for one of his vessels is upon the recommendation of some other skipper with whom he has sailed, and every one knows how little value such recommendations ordinarily possess.

(3) The enactment or the confirmation of laws by which the relations between the crew, the skipper, and the owners shall be clearly defined. It is the common belief that the same laws apply to the fishing vessels that are in force with respect to merchant vessels. Even if this be the case, the question of law is but little considered by the fishermen in the discipline on board of a fishing vessel. The officers should be supported in the necessary measures which they may take to quell insubordination or mutiny and to prevent disorderly conduct, the same rights being recognized as in the case of merchant vessels. The crews should be obliged to sign shipping papers in regular form, and these papers should be regarded as legal contracts, and means for their enforcement should be provided; this, too, without the necessity of protracted and expensive law suits. American consuls in foreign ports should be instructed to aid the masters of vessels in controlling disorderly men. Such a provision as the last one would have an important effect in controlling the acts of crews in provincial ports. It is now possible for two or three of the crew, by drunkenness and disorder, to neutralize the well-meant efforts of all their associates and prevent the success of the voyage.

(4) The investment of the officers of the vessel with a greater amount of dignity. It is, of course, impossible on board a fishing vessel to maintain the same kind of exclusiveness which prevails on a merchant vessel or a whaler. The number of officers is less, and the nature of the employment prevents all ceremony. At the same time it is within the power of the officers, by their personal bearing, to prevent familiarities on the part of the crew, and thereby greatly to increase their own influence.

Such provision for the maintenance of discipline on board of the vessels are especially necessary in a port like Gloucester, where the fishermen are of different nationalities and are often men who have been unable to hold their own in other ports on account of their notoriously bad characters. A considerable percentage of the fishermen of Gloucester resemble, more than those of any other American fishing port, the ordinary sailors, though far superior to the average men who compose the crews of merchant and whaling vessels.

SABINE ON DISCIPLINE OF FISHERMEN.—The following words, written by Sabine in 1852, and referring more particularly to the Labrador cod fishery, are none the less applicable at the present time, and to all branches of the fisheries of the United States:

“The selection of a master is a point so important to owners that a word upon his qualifications will not be amiss. Besides all the responsibilities at sea which devolve upon a master in the merchant service, he has cares and anxieties which are unknown to that branch of maritime adventure. His passage being safely made, the master of the merchantman is relieved by the counsel and assistance of the owner or consignee. But it is not so with the master of the fishing vessel. During the period devoted to fishing his labor is arduous in the extreme, and, come what will, in the desolate and distant regions which he visits his own sagacity and prudence are his only reliance. If, as not unfrequently happens, he be so unfortunate as to have among his crew two or three refractory spirits who seek to poison the minds of all the rest; if others, who boasted loudly, before sailing from home, how well and quickly they could use the splitting-knife, or how true and even-handed they were in distributing the salt, prove too ignorant to be trusted; or if

every man under his charge, without being dogged or incapable, is still of so leaden a mold as to remain immovable under promises of bounty or promotion, these difficulties must be but new inducements to use extraordinary personal exertions and to preserve his reputation at the expense of his health and strength. Even if there are none of these embarrassments to contend with, his ordinary employments require an iron frame and an unconquerable resolution.

"A friend who has seldom failed to accomplish what he has undertaken, and whose life has been full of daring enterprises, has often assured me that while on the Labrador shore his duty and the fear of making a 'broken' voyage kept him awake and at his post full twenty hours every day throughout the time employed in taking fish. 'Once,' said he, 'I was deceived by every man that I had on board my vessel, my mate alone excepted. Each shipped, as is usual, to perform a particular service, and each boasted of his accomplishments in catching, dressing down, or salting away; but there was neither a good boatman, an adroit splitter, nor a safe salter among them all. My situation was painful enough. I was interested in the loss or gains of the voyage, and was too poor and too young in command to bear the consequences of returning without a full fare; and, besides, I was never good at accounting for bad luck, and felt that it was far easier for me, even under these untoward circumstances, to fill my vessel than to explain to every one who would question me at home as to the causes of my failure, and the result of the matter was that I got as many fish per ton and per man as any vessel that I met on the coast.' 'Another season,' says the same friend, 'while in the West India trade, I was disappointed in obtaining a cargo, and was compelled to go to Labrador or haul my schooner up. I was too restless to be idle and resolved upon fishing. It was three weeks too late, and, on attempting to ship a crew, I found that no good men were to be had, and that I must take raw Irishmen, and a drunkard for a mate.

"The chances, as you may well suppose, were all against me, but I made the voyage and obtained as many fish as my vessel could carry. But I always had pistols in my pockets, and enforced most of my orders with a threat or a handspike. I slept full dressed, and with arms in my berth. A battle with one or more was almost of daily occurrence, and I was in constant fear either of losing my own life or of being compelled to take that of some one of my crew to overawe the rest.' These incidents occurred on voyages made from a port on the frontiers of Maine, and before the commencement of the temperance reform, and are, of course, to be regarded not only as having been rare in former times but as never happening now. But the master's duty, if he be an efficient man, is never an easy one. If he would provide for every contingency and make sure of a cargo despite of every adverse event, he must not even allow the full repose which nature craves. It is upon his regularity and perseverance in procuring fresh bait, a service which must sometimes be performed at the hazard of his life; upon the frequency of his visits to his boats, which are often miles asunder; upon his readiness to use his own hands to make up the laggard's deficiency; upon his economy and system in the use of time and outfits; upon the degree of energy and regularity which he infuses; and, finally, upon the care which he exercises in dressing and salting the object of his search that the success or failure of the voyage mainly depends. Masters who are able and willing to sustain these varied and incessant calls upon their bodily vigor and mental activity are to be found, probably, in every fishing port. But it is very certain that the number has sensibly diminished during the last twenty years, and that the transfer to other and more profitable and ambitious commands is still going on. The mercantile men of the commercial emporium of the North, and the packet-ships of the commercial emporium of the Union, rank deservedly high; but were their counting-rooms and quarter-decks to yield up all, or even half, of those whose birth-places were on the two capes of Massachusetts, and whose earliest adventures were made in fishing-craft, they would lose many high and honored names. So, too, were either

to cease recruiting from the same sources, the humble employment of which I am speaking would speedily become more prosperous, in public estimation more respectable, and of consequence be considered more worthy of the care and protection of our rulers."*

48. NAVIGATION.

NAUTICAL INSTRUMENTS CARRIED.—The best equipped schooners carry the following nautical instruments: (1) A chronometer; (2) a quadrant, octant, or sextant; (3) an aneroid barometer; (4) a spy-glass; (5) a clock; (6) a patent log, and (7) compasses, of which three kinds are used, viz, the wooden, brass, and liquid compasses. Every vessel carries two compasses, usually a wooden and a brass one; the former being used in light weather, the latter in stormy weather. The liquid compass is now often substituted for one of the others; in fact, the liquid compass has come into very general use of late years among the better class of Gloucester vessels.

The use of compasses on board of dories is not unfrequent. Some three or four extra compasses for this purpose are sometimes carried by different members of the crew on a vessel engaged in the off-shore fisheries. This practice is not as general as it should be, since these compasses are not furnished by the owners of the vessel, but are purchased by the crew for their personal use. Many men are unable to provide themselves with this very essential safeguard.

The vessels always carry one or more charts, with the parallel ruler and dividers necessary for their proper use, and many of them have a "Manual of Navigation"—commonly known as an Epitome—and a Coast Pilot.

Every sea-going vessel carries two compasses and occasionally an extra one in addition.

A clock is a part of the regular outfit, and there are very few of the larger vessels which do not carry a spy-glass.

Very few vessels go to sea without a barometer. This is the case not only with vessels from Gloucester but also those from other ports, except the small boats engaged in shore fishing. Nearly all the vessels which fish out of sight of land carry either a quadrant, sextant, or octant, the former being most commonly in use, while the latter, by its higher price, is prevented from being so generally adopted, although they are recognized as being better. The chronometer is very rarely carried, except on the vessels engaged in the halibut fishery, and not always on those. The Epitome and Nautical Almanac are necessary on board of vessels which carry a chronometer; but they are sometimes carried by vessels not thus provided.

The charts most popular among the fishermen, and generally in use, are those prepared by Capt. George Eldridge. The Coast Survey and Hydrographic Office charts are also occasionally included in the list. The Admiralty charts of the coast of the British Provinces are used to some extent by vessels fishing in the Gulf of Saint Lawrence, or such as are habitually visiting Provincial ports for bait.

Blunt's "American Coast Pilot" is generally in use; the excellent manual published by the Coast Survey rarely finds its way on board of our vessels.

It is very unusual to find a vessel without an almanac, in which are given, in a convenient form for reference, tide-tables for the important ports along the coast. The Farmer's Almanac, published in Boston, is the favorite among the New England fishermen.

The vessels are fitted out with these instruments in the following manner: The compasses and the clock are a part of the regular outfit of the vessel and are supplied by the owner, as also is generally the spy-glass; but the remainder of the apparatus and the charts are generally owned

* American Fisheries, pp. 171, 172.

by the skipper; the extra compasses for use in the dories, as has already been mentioned, being supplied by different members of the crew.

When a chronometer is used, it is ordinarily hired by the skipper, the crew paying half and the vessel half. It is insured by its owner, and the cost of insurance charged in the rent, so that if it is lost with the vessel there is no demand for restoration upon those who hired it.

Previous to 1865 few fishing vessels carried a log of any description. Occasionally an old-style "chip-log" was seen on board, but as a rule fishermen estimated their speed by noting alongside how fast the vessel passed through the water—a somewhat unique method of keeping "dead reckoning." It may seem remarkable that anything like accuracy could have been thus attained, but we are assured that many of the old fishermen became exceedingly expert in judging a vessel's speed, and with their knowledge of local currents and the frequent use of the sounding-lead they seldom failed to make good "land-falls."

Some form of patent "harpoon" log is now most commonly used, since these are less expensive than the patent taffrail logs. The liability of the former to injury in shallow water or to loss through sharks biting off the tow-line has of late led to the more general use of the taffrail logs, which are considered the most reliable.

USE OF NAUTICAL INSTRUMENTS.—The manner in which the masters of fishing vessels learn the art of navigation is discussed in another chapter. It is sufficient to remark here that those in charge of the vessels belonging to the Gloucester off-shore fleet are frequently very competent navigators, others, though they may have sufficient knowledge to sail a vessel back and forth, are really not so competent as they should be.

The skippers of mackerel schooners and other vessels which are usually in sight of land have less use for instruments, and rarely, if ever, take observations.

Much of the success of the fishermen, in bringing their vessels into harbor without accident, is due to their habit of taking frequent soundings, and to their intimate knowledge of the shape and character of the bottom along those portions of the coast which they chiefly frequent.

D.—DANGERS OF THE FISHERIES.

49. DANGERS TO THE VESSELS.

The characteristics of the fishing schooner and its management will be discussed hereafter. We shall here consider the dangers to which these vessels and their crews are exposed.

The dangers to which these vessels are liable may be considered under nine heads: (*a*) Dangers on the fishing grounds; (*b*) dangers encountered while making passages to and from the grounds; (*c*) dangers in approaching and leaving the shore; (*d*) dangers from collision; (*e*) dangers of the harbor; (*f*) dangers from ice; (*g*) dangers from fire or lightning; (*h*) dangers from attacks of marine animals; (*i*) and dangers from defects in the construction of the vessel itself.

DANGERS ON THE FISHING GROUNDS.

DANGERS OF THE COD FISHERY ON GEORGE'S BANK.—Judging from the record of disasters, the George's fishery is probably the most dangerous one in the world. On this ground over one hundred Gloucester vessels are constantly employed, winter and summer. In summer a few New London vessels resort there, principally for halibut, and it is also visited by a fleet of mackerel catchers. The peculiar dangers of this fishery are encountered chiefly in the winter. It is the custom for the vessels in winter to anchor close to one another upon some portion of the Banks. The favorite locality is in the immediate vicinity and to the eastward of extensive shoals, on which there is from 2 to 12 fathoms of water, and where the waves break in rough weather. There are few instances where vessels which have been lost in this locality have left any record of the nature of the disaster which befell them. There is therefore doubt as to how most of the losses have occurred, but the theory is generally accepted that the vessels drifted into shallow water and foundered. There have been a few cases in which vessels have righted with loss of masts after being rolled over by the waves, and the crews have survived to tell the tale. Most of the losses have been during heavy easterly gales, when the vessels may have been forced into shallow water. The proximity in which the vessels are anchored greatly enhances the danger to which they are exposed, for if one of them goes adrift it may become necessary for many of those to leeward to cut their cables and also go adrift. Sometimes nearly the whole fleet has been thus set adrift at once. Of course, if they can retain their hold upon the bottom they are in comparatively little danger.

The theory is held by many fishermen that loss is often occasioned by a drifting vessel coming into collision with one at anchor, an accident which is most surely attended with fatal results to both. There is only once instance on record where a vessel thus drifting into contact with another escaped destruction, and in this case the vessel which she struck immediately sunk. This theory receives strong support from the fact that there have been so many hundreds of narrow escapes from collision between vessels thus drifting about. In the columns of the Cape Ann Advertiser and in the Gloucester "Fisherman's Memorial and Record Book" may be found recorded numerous instances of this kind. These gales are generally accompanied by dense snow and often also by extreme cold which renders it quite impossible for the men to look to windward and to see a drifting vessel in time to cut the cable and escape collision. It is the common custom for the entire crews at such times to remain on deck, prepared for any emergency, and if it is possible

to see the drifting vessel in time they may succeed in getting clear. Since there is no insurance on cables, there is great reluctance to cut them as long as there is a possible chance of escape from collision in any other way. Then, too, the men feel that if they can hold fast to their anchorage they are safer than they would be if adrift and running the risk of going on the shoals or colliding with other vessels. For these reasons they often refrain from cutting the cables until it is too late, in hopes that the drifting vessel will clear them. Numerous instances are told of cables having been cut only when the approaching vessel was on the top of a wave and the one at anchor was in the hollow of the sea directly under it. At such times a moment's delay would be fatal. There are doubtless many instances of careless negligence in failing to keep a proper watch and in not having the appliances at hand for cutting the cable. Very often the ropes are stiffened with ice and the sails so heavy with snow that it is impossible to raise them in time to avoid disaster, even though there may be time to cut the cable. Perhaps, however, the principal cause of disaster is the reckless daring of the fishermen, who persist in remaining at anchor in close proximity to other vessels even when they see the gale is coming, and, by removing their anchorage a short distance, they might greatly lessen the risks of disaster. They are led to remain in the same position, and to take resulting risks, both from the fear of losing an opportunity of securing a fare of fish, and from a dislike to the appearance of timidity. In spite of all the dangers, and the fact that so many vessels of the George's fleet are yearly wrecked, there are many skippers in the service who have never sustained even a serious loss of property. An old Gloucester skipper told us that for 24 years he had fished on George's and had never lost even a cable. He attributed his good fortune to the fact that in the pleasantest weather he never "turned in" at night without seeing that everything on deck was ready for the most unexpected emergency. The skippers who can boast such a record as this are men usually renowned for prudence, skill, and intelligence. In many instances the greatest care is rendered ineffectual by the recklessness of others.

DANGERS ENCOUNTERED BY THE BANK FLEETS.—Vessels fishing on Le Have Bank, the Grand Bank, and other banks of this region, are exposed to dangers scarcely less to be dreaded than those which have just been described. On account of the greater depth of the water the likelihood of foundering upon the shoals is less, except in the vicinity of Virgin Rocks and Sable Island. The vessels do not congregate in fleets to such an extent as upon George's, and the peril from collision is therefore less imminent. Although, when the number of vessels engaged is taken into account, the losses in the Bank fishery have not been so numerous as on George's, still there have been several seasons when the losses have been large, as in December, 1876, when twelve sail and one hundred men were lost on Le Have, the Western Bank, and Banquereau; and again in the fall of 1879, when the loss was little less severe. Another element of danger from collision is met with in the Bank fisheries, for in the summer and fall the fishing fleet is located directly in the track of the ocean steamers plying from Europe to the United States. There are few, if any, recorded instances of the destruction of vessels in this manner, but losses have occurred in summer when the weather was pleasant and when the only plausible theory to account for their loss was that they had been run down by passing steamers.

Vessels of the Gloucester halibut fleet are accustomed to lie at anchor in winter in water from 100 to 200 fathoms deep, and are consequently much more likely to go adrift than the George's-men, which are anchored in water varying in depth from 25 to 35 fathoms. When once adrift, they are obliged to "lie to" in heavy weather, and are exposed to much greater danger than when at anchor. The greatest danger to the drifting vessel is its liability to drift into shallow water and to bring up suddenly by the anchor taking a fresh hold upon the bottom. This often causes them to ship heavy seas or to be knocked down—that is, to be turned over flat on their sides so

that the masts touch the water. The schooner *David A. Story*, in December, 1880, got adrift in this manner, and one of her crew reports that in his opinion the anchor caught, and that she shipped a sea which knocked her down, causing her cable to part. Fortunately none of her crew were lost, but the man on watch had his leg broken, the vessel's deck was swept, her foresail split to pieces, fore boom and gaff broken, and 400 fathoms of cable lost. A similar accident occurred to the schooner *Andrew Leighton*, of Gloucester, December 10, 1876. While adrift she was knocked down by a sea so that, according to the statement of her crew, her mast-heads lay in the water. Fortunately, however, she righted, and ultimately succeeded in reaching home in safety. This vessel was lost in October, 1879, and it may be met her fate in this manner.

Vessels lying at anchor on the Grand Bank under riding-sail alone are sometimes knocked over by tornadoes. An instance of this kind occurred on the 29th of August, 1876, when the schooner *Walter F. Falt*, of Gloucester, was blown over. The crew was lost, and the vessel was afterward seen floating upon her side. In the fall of 1875 the schooner *Epes Tarr*, of Gloucester, anchored on the eastern part of the Grand Bank, was knocked down and dismasted.

The frequent loss of the rudders of fishing vessels, while at anchor on the Banks, is another danger to which they are liable. Many instances of this kind have occurred. In most cases the fishermen have succeeded in rigging a temporary steering apparatus, by which they have been enabled to reach the home port in safety. Some vessels have been lost through the rudder-braces getting loose, and the consequent wrenching of the rudder-head starting a leak which caused the abandonment of the vessel. An instance of this kind occurred on the Grand Bank in the spring of 1879, when the schooner *Edwin C. Dolliver*, of Gloucester, sprung a leak and sunk. Her crew was taken off and brought home by the schooner *Thresher*, of the same port. In addition to the danger of being knocked over, there is that of shipping a sea while at anchor, which is sometimes attended with serious results, both to the vessels and the men.

Heavy seas are so often shipped that numerous instances might be cited, but one or two will suffice. In the early part of 1877 the schooner *John S. Presson*, of Gloucester, while riding out a heavy northwest gale on the western part of the Grand Bank, shipped a sea which swept her decks and injured her about the stern to such an extent that, after the gale abated, she was obliged to put into Halifax for repairs. In January, 1879, the schooner *Howard*, while at anchor in the deep water on the southern edge of Le Have Ridges, shipped a heavy sea which swept her decks, smashing several of the dories and starting the house on deck, causing her to leak considerably.

DANGERS TO WHALING VESSELS.—Whaling vessels are not exposed to so great danger as the merchant vessels passing over the same portions of the ocean. The whalers, while on the cruising grounds, are under short sail and keep a careful lookout, especially at night, when, if there be anything unusual or unexpected, demanding speedy work, all hands can be called, and only a few moments are then required to shorten sail and make everything snug. In thick weather, however, especially on the Arctic grounds, there is greater danger on account of ice and of collision with other vessels.

DANGERS TO SEALING VESSELS.—The fur-seal fishery is carried on in the Antarctic Ocean, where the vessels are at all times exposed to sudden changes of wind, and frequently to heavy gales, which unexpectedly overtake them on a lee-shore and sometimes cause their loss.

The schooners used in the seal fisheries are liable to some of the disasters to which the Gloucester fishing vessels are subjected, except those accidents caused by carrying too heavy press of sail, for in this respect the seal fishermen exercise more prudence. Sealing schooners are compelled to keep comparatively near land, following up the boats sent ashore to take the seals, and are exposed to the dangers of being blown ashore or driven on rocks. In landing boats, sent from

the sealing schooners ashore to bring back the seal-skins, there is great danger of being swamped, or upset, and injured by the heavy surf. About four years ago a boat's crew of twelve men was lost in this manner. A successful landing is, of course, attained only by carefully watching for an interval between the breakers, allowing sufficient time for the boat to be run upon the shore.

In the sea-elephant fishery vessels are lost by being driven ashore, or on the rocks, from their anchorage, there being no protection, in the way of good harbors, from the violence of on-shore gales.

The bottom of the bays of Heard's Island, in the Southern Indian Ocean, which is the principal resort for sea-elephants, is hard, slaty rock, and therefore extremely poor ground for anchorage. On this account, as well as from the fact that the harbors afford indifferent shelter, several vessels have been lost in that locality, having been driven ashore, though having out anchors disproportionately large compared with the size of the vessels.

The vessels used in this fishery are exactly like whaling vessels, and the boats belonging to the vessels are the same as those used in both sealing and whaling, than which no boats are better fitted for landing in the surf.

DANGERS TO VESSELS FISHING ALONG THE COAST.—The principal dangers to which the mackerel vessels are exposed are heavy and sudden gales, by which they are taken unawares and driven upon a lee-shore. They generally fish near the coast, and are therefore specially liable to this danger. They are, however, excellent sailers, and, except under extraordinary circumstances, can make a harbor, or gain an offing before the gale is too heavy. The chief disasters to the mackerel fleet have occurred in the Gulf of Saint Lawrence, in the vicinity of the Magdalen Islands, Cape Breton, and Prince Edward Island. The north shore of the latter island has been the scene of many disasters. This is a peculiarly undesirable spot for vessels in a gale. There is a long stretch of coast, crescentic in shape, without available harbors in a gale, while at either end of the crescent are long sand-bars, the whole forming a pocket out of which it is very difficult for a vessel to beat its way. In the "Yankee gale" of 1851 a great many vessels were cast ashore along this whole coast. Losses have occurred since then, the severest ones in 1873, when many vessels and lives were lost in that vicinity. Disasters have been frequent at the Magdalens, resulting in loss of property and lives. As many as twenty-four sail of vessels were driven ashore at Pleasant Bay, on Amherst Island, one of the Magdalens, in 1873. Cheticamp, a one-sided harbor or anchoring place on the north side of Cape Breton Island, has also become somewhat noted for the losses that have occurred to the mackerel fleet in that locality. These have been chiefly during the prevalence of southeast gales, which blow with almost irresistible fury from the highlands forming the southern side of the harbor. In this region most of the harbors have a bar at the entrance, and are consequently most difficult of access at the very time when most needed. The water, too, is shallow, and in heavy gales the seas are sharp and exceedingly dangerous, making it very difficult for a vessel to work off from a lee-shore. To add to the danger, there is a current usually setting in the same direction as the wind. When the winds blow over the highlands of the islands they are squally and baffling. A gale in the Gulf of Saint Lawrence is, perhaps, more dreaded by fishermen than one on any other part of the coast, as it can rarely occur without bringing them in close proximity to a lee-shore.

Gloucester has suffered less in proportion to the size of its fleet in the Gulf of Saint Lawrence than have Provincetown, Wellfleet, and the various ports of Maine. Cape Cod lost largely in the gale of 1851, but not so much in that of 1873. One reason for the fewer wrecks among the Gloucester vessels was the fact that they are better prepared with anchors and cables than any other vessels in the world. Great loss of life has resulted from these disasters, though the drifting of a

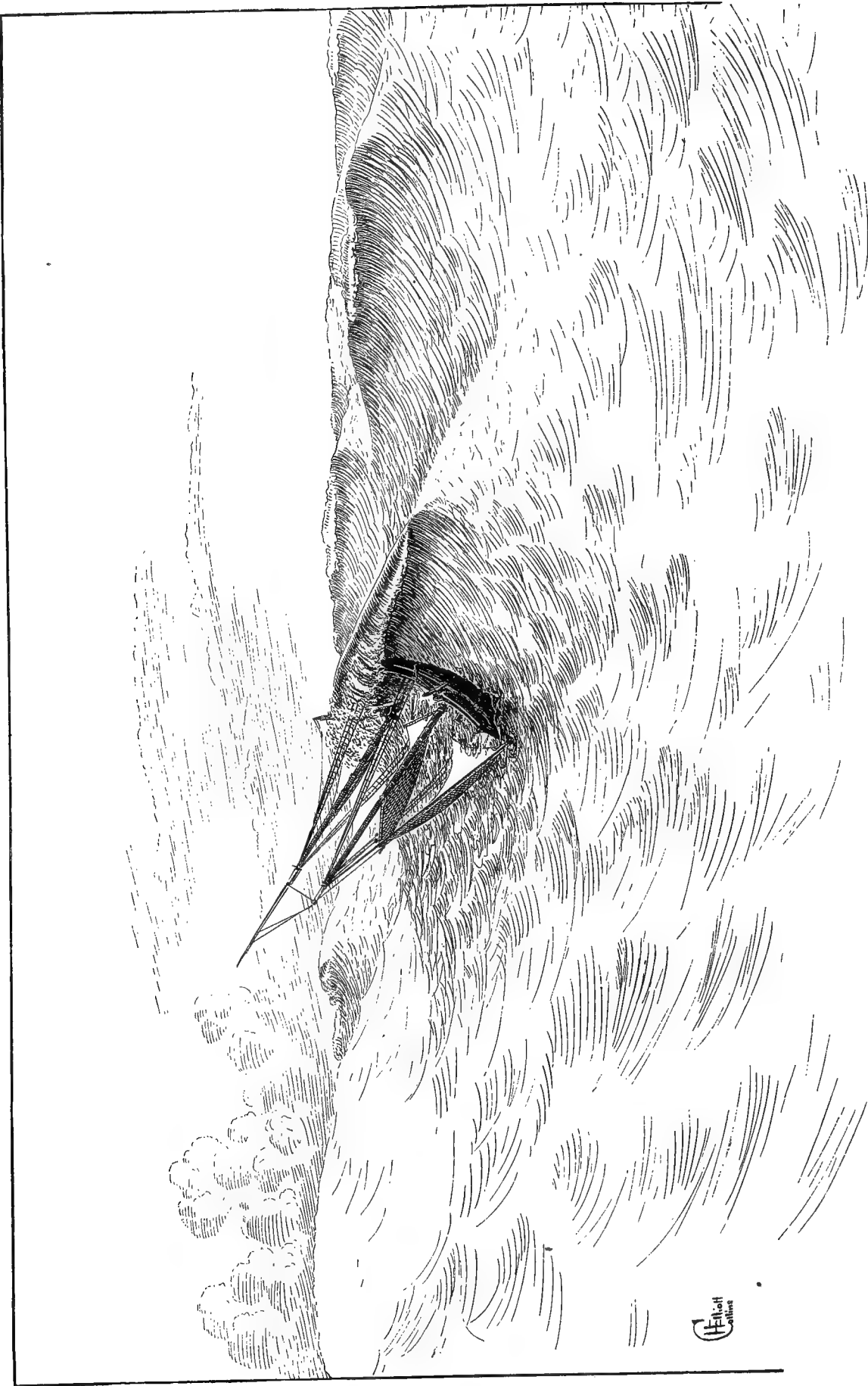
vessel upon the shore is not always attended with fatal consequences. In many cases the shores are sandy, and the crews are enabled to land in safety before the vessel goes to pieces. In some instances the vessels are forced ashore by putting on a great amount of sail, so that the men can land dry-footed when the tide ebbs. It is frequently the case that vessels are launched again, after the gale has abated, without suffering any serious injury. When this is not possible, the fish are landed and sent home, and the fittings and stores, and even the hull itself, sold at auction for the benefit of the owners. The American vessels are so strongly and well built that even after they have been sunk they are sometimes sold at auction as they lie under water, and afterward raised and refitted for active service.

The best chance for safety, in cases where it is seen that a vessel must go ashore, is to run them bow first upon the land, especially where the beach is sloping. When this is done, all sail that the vessel is capable of carrying is spread.

DANGERS WHILE MAKING PASSAGES TO AND FROM THE FISHING GROUNDS.

Fishing vessels making passages at any season of the year are subject to the same dangers as other sea-going crafts. In summer the dangers are comparatively few, for the winds are usually moderate, and in warm weather the crew is in better condition to handle the vessel properly and to meet any exigencies that may arise. Tremendous hurricanes, however, sometimes occur in August and September, and at times there are gales even during the other summer months. Two of the most remarkable hurricanes in recent years were those of September 8, 1869, and August 24, 1873, both of which caused a great amount of destruction to life and property in the fishing fleet. At the time of the hurricane of 1873 several vessels were on the passage home from the Grand Bank. They were deeply laden with fish. Some vessels were lost and many met with serious damage and narrowly escaped destruction. Mention of a few instances of this kind will perhaps suffice. The schooner B. D. Hawkins, of Gloucester, was caught in a hurricane in the vicinity of Sable Island. At first she was hove to under a two-reefed foresail, which was later reduced to a three-reefed. After lying in this manner for some hours, she began to drift toward the northwest bar of Sable Island and was soon in shoal water. It became necessary to take in sail and to anchor, but the wind blew with such violence that the anchor would not hold and the vessel drifted into only 11 or 12 fathoms of water. As she would certainly be lost unless something were done to check her onward course, the spars were cut away and let go "by the board," and, with considerable difficulty, were cleared from the wreck. With the masts gone, she presented a much smaller surface to the wind, and as the current set to windward the anchor held and she rode out the gale. After the gale, jury-masts were rigged and the vessel worked toward the land. She was finally towed to Port Hawkesbury, in the Strait of Canso, to be repaired.

The schooner Sarah P. Ayre, of Gloucester, which was also on her passage home from the Grand Bank, encountered the hurricane in the vicinity of the eastern part of Banquereau. The wind blew with such violence that it was soon impossible to keep sail on the vessel. She was kept nearly head to the sea by the aid of a "drag" rigged to the anchor, which was paid out more than 100 fathoms. After drifting for a few hours the anchor caught bottom on the shoal part of Banquereau in from 16 to 20 fathoms of water, and where the sea ran so high and sharp that for a time it was thought that the vessel would founder. The crew, however, with difficulty succeeded in cutting the cable. The vessel then drove under bare poles before the gale, broadside to the sea and wind. By throwing out oil the force of the waves was so reduced that she met with little



Fishing schooner under sail, tripped by a heavy sea
Drawing by H. W. Elliott and Capt. J. W. Collins.

H. W. Elliott
Capt. J. W. Collins

loss. It is supposed that the schooner *Henry Clay*, of Gloucester, another of the Grand Bank fleet returning home, was lost in this same hurricane.

Although the fishermen are exposed to more or less dangers in the summer season, these are greatly increased in the winter months, when heavy gales are very frequent, and the perils made greater by extreme cold. The rigging and sails are then coated with ice and snow and it is almost impossible to either set or shorten sail.

DANGER OF BEING "TRIPPED."—A vessel may be knocked down or tripped, either while running before the wind or lying to in a gale. The comparative shallowness of the American fishing schooners renders them particularly liable to this class of disasters. Some branches of the fisheries, especially those for fresh halibut and haddock, render it imperative that the passage home should be made with the utmost dispatch, in order that cargoes may arrive in good condition and therefore bring the highest prices. Great risks are taken by these fishermen in running their vessels during gales, frequently in the trough of the sea. This is extremely hazardous and likely to result in the vessel being "tripped," or knocked on her beam ends. In February, 1876, the schooner *Howard*, while returning from the Grand Bank with a trip of fresh halibut, was running in a strong northeast gale. She was knocked on her beam ends twice in one day. At first she was running with a two-reefed mainsail, and when she tripped she went over so far that the men who were sleeping below were thrown from the weather into the leeward bunks and everything movable was upset. Fortunately, she righted with slight damage. Notwithstanding this narrow escape, the demands of the business were such that instead of the vessel being hove to, the sail was shortened and she continued to run safely until just before night, when another sea took her on the quarter and threw her down so low that the sails again lay in the water, the whole after part of the vessel was submerged, and the water ran over the forward companion-way, partially filling the forecastle. For a short time it was thought that she could not regain her upright position, but everything held securely and she soon righted. On the 28th of January, 1881, the schooner *Edith M. Pew*, employed in the haddock fishery, was thrown on her beam ends, partially filling the cabin and forecastle, and throwing the cabin stove, full of hot coals, into the captain's bunk. The fire was extinguished before any damage was done. She fortunately righted again without any serious disaster. These occurrences are dangerous in the extreme, and fishermen who escape with their lives may be accounted fortunate.

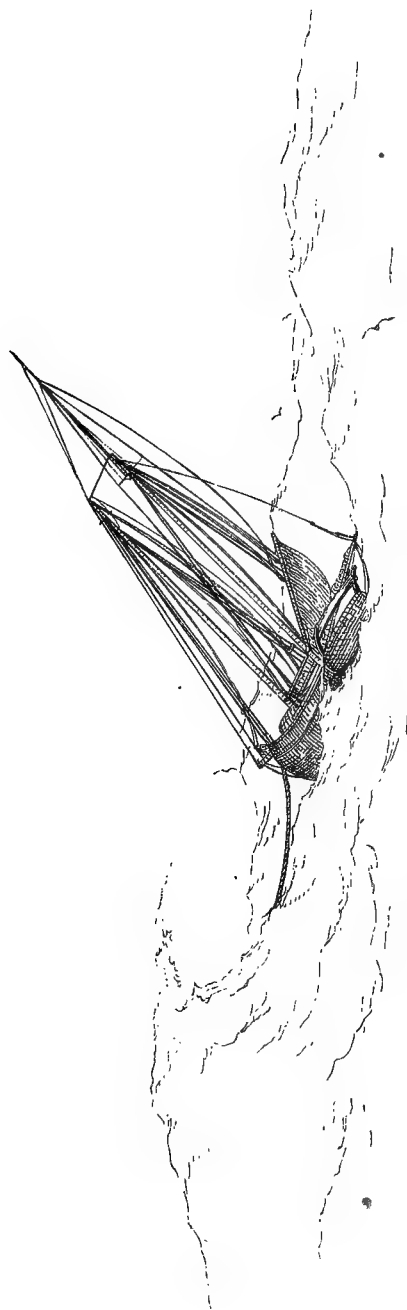
"The schooner *Sarah C. Pyle*, Capt. Richard Warren, was struck by a cross sea and capsized January 30, 1870. The crew found safety by clinging to the sides of the vessel, until one of their number was able to cut away the main shrouds with a pocket-knife, when the vessel righted, nearly full of water. The foremast was cut away and a jury mast rigged with the foreboom, and such progress as was possible was made in a westerly direction. For eight days the men were obliged to cook their food in sea water, their water casks having been lost, and to melt ice to furnish drink. At the end of that time they encountered a vessel and were furnished with water and other necessities. Five of the crew were transferred to the vessel, but the skipper and four men remained on the wreck, determined to get it into port. In this condition they encountered a terrific gale, of three days' duration, and were blown off seawards a distance of 245 miles. Even then they remained undaunted by danger and firm in their intention of rescuing the property under their charge, and declined an offer to be taken off. The wreck was towed into a New Jersey port February 13, two weeks after the disaster—a fortnight crowded with great hardship and danger to the men so faithful to duty."*

* Gloucester and its Fisheries, p. 65.

SPARS AND SAILS CARRIED AWAY.—The danger of losing masts and rigging has already been considered. Spars and sails are, however, often carried away under other circumstances. Accidents of this sort are liable to occur at all times, though naturally much more so in the winter season. Perhaps no class of sea-faring men take greater risks than fishermen in carrying a heavy press of sail. In branches of the fisheries where it is extremely desirable to make rapid passages this propensity is carried to an extreme, and, as a result, the sails are sometimes blown away or masts are broken, and, perhaps, other dangers are incurred. Perhaps the most common way in which vessels are dismasted is by carrying a press of sail against a head sea. Another cause of accident is that of jibing fore and aft sails suddenly from one side to the other when there is a strong wind. This generally results in breaking the booms or the mast. The temptation to make a speedy passage is so strong that risks will be taken, although the ultimate results of such reckless daring may be a loss rather than a gain.

RUNNING UNDER, OR CAPSIZING.—The tendency to carry a heavy press of sail may result in greater loss than that of spars and sails. The vessel may run under while going before the wind or capsize when sailing by the wind or with the wind abeam. As there have been numerous and oft-repeated hair-breadth escapes from such disasters, it is probable that much property and many lives have been thus lost. Such disasters are perhaps sometimes unavoidable, because of sudden and unexpected squalls, especially in the night, although many of them are the result of gross recklessness. Not only does the master imperil his own life but also the lives of his crew. So fearless and ardent are the fishermen that the better judgment of the skipper is frequently overcome by the solicitations of the crew, and in the hope of outstripping some rival vessel sail is carried in unreasonable excess. This is often the case when a vessel has just left port. The crew are then, perhaps, under the influence of spirituous liquors, which renders them more regardless of danger than common, and unable to properly perform their duty. Several vessels have been lost, presumably soon after leaving port, and their loss is ascribed to such causes. Of the many instances related by the fishermen of narrow escapes either from carrying sail or being struck by sudden squalls, we will mention the following: In the fall of 1877 the schooner Wachusett was running for the Grand Bank in company with the schooner Howard. With a strong northwest breeze the vessels left Gloucester together, and the following night, when about a hundred miles from Cape Ann, the wind increased. The Howard shortened sail, but the Wachusett, attempting to carry all she had spread for some time longer, was struck by a heavy puff and driven under so that her fore-castle was partly filled with water. The men on watch at once lowered the mainsail part way down, which relieved the vessel and a disaster was averted. In March, 1878, the schooner Marion, while returning from the Grand Bank, was running in a southeast rain-storm under three lower sails. It was night and intensely dark. The wind blew strong and was increasing fast. All hands were called to shorten sail. Before it could be done a squall struck the vessel and buried her lee side completely under water and came near sinking her. The blackness of night made it difficult to shorten sail, but the sails were lowered with the least possible delay and fortunately in time to avoid any serious disaster.

The narrow escapes described were in the case of vessels running free from the wind. There is also great danger in carrying a heavy press of sail while sailing by the wind or with the wind abeam. It is not uncommon for some of the more headstrong of the fishing skippers to carry so much sail on their vessels that the lee rail is completely under water most of the time. A few vessels may be able to stand being driven in this manner with comparative safety, but with the majority of them it is highly dangerous, and liable to result not only in the loss of the vessel by capsizing and filling, but also in the loss of the lives of the crew. Many instances are related by the fisher-



Fishing schooner lying to at a drag in a gale on the Banks.
Drawing by Capt. J. W. Collins.

men of narrow escapes from serious disasters while sailing by the wind under too much canvas, and a few instances of loss of vessels, with more or less lives, are on record where they have been capsized in this manner. The schooner *Angie S. Friend*, engaged in the haddock fishery, while beating up Boston harbor in a strong northwest wind, was capsized, and, having filled, sank to the bottom. Part of the crew succeeded in getting into one of the dories; they were without oars, but fortunately drifted ashore. The rest of the men, with the exception of one, who was drowned, climbed to the masthead, which remained above water, and clung there through the night. They were rescued the following morning in an almost senseless condition. The schooner *Henrietta Greenleaf*, of Gloucester, while making her first passage to the Grand Bank in the spring of 1876, was struck by a squall in the night and knocked on her beam ends, and quickly filled with water. Four of the crew were drowned in the cabin and forecastle. The rest escaped in two dories, but being without oars they drifted helplessly about. They suffered greatly from exposure to the cold and flying spray. The dories soon separated from each other. One of them was picked up by another fishing vessel, though not until one of the men had died from exposure. The other dory, with five men, was never heard from.

The fury with which these squalls sometimes strike can scarcely be comprehended by those who have not witnessed them. The schooner *Abby Dodge*, which was making a passage to the Grand Bank in December, 1868, was struck by a tornado with such force that, although she was at the time lying to under a two-reefed foresail, she was knocked nearly on her beam ends, and only by the prompt lowering of the sail was the vessel saved.

RUNNING ON SHOALS OR ROCKS.—While making passages to and from the fishing grounds, vessels are liable to strike on shoals or outlying ledges. In that part of the Western Atlantic most frequented by New England vessels there are many of these dangerous places, either in the track to the grounds or on the banks themselves. The most remarkable of these shoals, and possibly those which have been the cause of more losses to the fishing fleet than any other, are those of George's Bank. These are but little out of the course of the vessels frequenting George's in winter. A small error in the compass may bring a vessel unexpectedly on these shoals. The more prudent fishermen guard against this danger by the careful use of the sounding-lead. It is difficult to tell how extensive these losses have been. Many vessels have had narrow escapes, but the lost ones leave no survivors to tell the tale.

The shoal of Cashe's Ledge is a source of special danger, as it lies almost directly in the vessel's track, both in going to and coming from most of the fishing grounds. Although this ledge is not shoal enough for a vessel to strike under ordinary circumstances, it nevertheless breaks in heavy weather and is therefore extremely dangerous to be encountered at such times. There is no mark, no buoy nor light-ship, to distinguish the shoal places, and it is not easy to tell when the vessel is approaching them. It cannot be wondered at that several disasters have occurred in that vicinity.

The schooner *Rattler*, while returning from Newfoundland to Gloucester with a trip of frozen herring, on the 17th of January, 1867, passed over this shoal, where she encountered heavy seas which threw her on her beam ends and dismasted her. It was supposed that the schooner *John W. Low* was lost there in the same gale.

There is a shoal on the northern part of Brown's Bank on which there is said to be not more than 9 to 14 fathoms of water. This shoal, though not to be dreaded so much as George's or Cashe's Shoals, is, nevertheless, a danger to be carefully avoided. It is in the direct track of the fishing fleets on their way to and from the various banks. Several instances are related in which vessels have met with perilous adventures in that locality and only narrowly escaped destruction.

The long sand-bars that extend out from either end of Sable Island, for a distance of 10 to 12

miles, are very dangerous to vessels on the passage to and from the Grand Bank and other eastern banks. For a great portion of the year this island is enveloped in dense fogs, and the currents in the vicinity being very irregular, it is extremely difficult for the mariner to tell his exact position.

There are outlying rocks and ledges off the coast of Nova Scotia which are in the track of vessels going to and from the Gulf of Saint Lawrence and the eastern banks. Many serious disasters have occurred on these ledges and rocks and there are several instances of narrow escapes from destruction.

DANGERS TO WHALERS.—The principal dangers thus far mentioned have been those encountered by vessels in the cod, mackerel, and halibut fisheries from New England. We have yet to consider the dangers to the whaling and sealing fleets. These vessels are, of course, liable to many of the same perils as the fishing craft, especially to heavy gales and squalls. On the passage to the cruising grounds the whaling vessels do not carry so much sail as merchant or fishing vessels, time not being to them of such vast importance. Dangers, common to other vessels, are less likely to happen to whalers. From the start of a voyage, men are continually aloft on the watch for whales, and are likely to see approaching danger more quickly than in the case of a merchant ship, where only one man is on the lookout, and he, as a rule, not expecting any immediate danger. Whalemen are generally well trained and ready for duty at a moment's notice. Only one-half of the crew, comprising one watch, is on deck at a time, but in case of danger or the approach of whales, all can be quickly summoned. As a rule, the half of a whaling crew includes more men than the entire crew of a merchant vessel of the same size.

Instances of whaling vessels being blown over or of waves breaking over them, thereby causing damage, are not common. Such disasters sometimes, however, occur to vessels in the Arctic or Antarctic Oceans, where they are exposed to severe gales.

DANGERS IN LEAVING AND APPROACHING THE SHORE.

The dangers incurred in approaching and leaving the shores are perhaps more to be dreaded than any others, and great skill, coolness, and prudence are requisite to avoid disaster. This is especially the case in the fisheries of New England, because nearly all of the larger and most frequented fishing grounds lie in an easterly direction from the coast. Easterly winds, which are fair for making passages toward the land, are generally accompanied with thick weather. This is especially the case in winter, when severe snow-storms often overtake the fishermen when but a few miles from land and on a lee shore. The density of the snow often renders it impossible to discern objects far enough off to clear them, and it is at the utmost hazard that the fishermen undertake to make a harbor. They often approach so near the land before the weather becomes thick that it is as dangerous to attempt to keep off shore as it is to approach it. Fishermen are induced to take the latter risk for the reason that if they do succeed in making harbor they will escape being exposed to the storm on a lee shore, and may also obtain a higher price for their fish. Probably no other class of sea-faring men take such great risks in running for the land, but such is the fishermen's knowledge of the coast and their skill in handling their vessels that, although there are many hair-breadth escapes, there are comparatively few disasters resulting from this cause. The following are given as a few of the many instances of this character that have occurred to our fishing fleet:

On the 26th of February, 1863, the schooner *Mary E. Hiltz* was lost off Marblehead during a violent snow-storm while on her homeward passage from Newfoundland, and one of her crew was drowned.

During a gale on the 10th of January, 1878, the schooner *Little Kate* went ashore near Duxbury, and her entire crew of thirteen men were drowned.

In February, 1878, the schooner *Eastern Queen*, of Gloucester, while returning from George's Bank, ran into Massachusetts Bay in the night. The wind was blowing strong from the northeast, and the vessel was running under a press of sail when the lookout suddenly descried land ahead. He instantly shouted to the man at the wheel. The helm was put down and the vessel brought to the wind, but before this had been fairly accomplished she struck on a ledge. Notwithstanding the imminent peril in which they were placed, they succeeded in getting the sheets trimmed by the wind, and this careened the vessel so much that after striking two or three times she jumped over the sunken ledge. Although she had struck heavily she still remained tight and was worked off the lee shore, arriving in Gloucester the following day in safety.

Vessels leaving the land, bound to the fishing grounds, though starting with a favorable wind, may meet with violent easterly gales before obtaining sufficient sea-room. These gales are generally accompanied with snow, and the vessels being on a lee shore it is sometimes difficult to escape disaster. The class of vessels under consideration are better provided with cables and anchors than any other sea-going craft, and are thus enabled to ride out a gale safely on a lee shore, in which no vessel carrying canvas could successfully work to windward. This is, doubtless, one of the reasons why the loss of vessels from being driven ashore in gales is comparatively small. Although gales are less frequent in the spring and summer seasons, the prevalence of dense fogs exposes the fishermen and all seamen to considerable dangers when approaching the land, and many disasters, some of them serious in character, have happened from this cause. Such dangers are not unlike those already discussed, except that they are not usually accompanied by such high winds, and, occurring during the warmer part of the year, are not so sure to be disastrous.

THE DANGERS OF COLLISION WITH OTHER VESSELS.

COLLISIONS ON THE FISHING GROUNDS.—The danger of collision is to be dreaded. Many losses have resulted from accidents of this kind, and lives, as well as property, have been sacrificed. Collisions are especially liable in localities where great numbers of vessels are passing and repassing, as in the vicinity of Long Island Sound, or off Sandy Hook, New York, on Nantucket Shoals, off Cape Cod, or near Cape Sable, Nova Scotia.

Fishing vessels are perhaps more liable to collision than any other vessels, because of their tendency to gather in large fleets, where fish—and especially mackerel—are found abundant. Such is the ardor of pursuit that the loss of booms and other light spars is considered of small importance, and the risk of losing them is often incurred in hopes of obtaining some advantage in the fishery.

Another fruitful season of collision is when a fleet of several hundred sail makes the attempt to enter the same harbor at one time. They crowd in such numbers at the harbor's entrance that it is next to impossible for them all to escape some damage. The injuries thus sustained are generally of minor importance, such as carrying away booms or bowsprits. Some of the serious losses by collision are the following:

On September 26, 1869, the schooner *Isaac Walton*, of Gloucester, while returning from George's Bank, came into collision with the schooner *William Babson*, and received such injuries that she sank shortly afterward. The crew were saved.

On March 17, 1864, the schooner *Triumph*, of the same port, while bound to New York, was run down and sunk by the steamer *Western Metropolis*. The captain and three of her crew were saved by a boat from the steamer, but two of the crew were drowned.

On January 17, 1873, the schooner Franklin A. was run down by the schooner E. B. Phillips, off Falkland Island, Long Island Sound. The E. B. Phillips struck the Franklin A. amidships, carrying away both masts and cutting through the hull, causing the latter to sink almost immediately. The captain and the mate were knocked overboard by the shock of the colliding vessels, but were rescued, narrowly escaping a watery grave.

On May 31, 1865, the schooner Northern Chief, returning to Gloucester from the Western Bank, was run down and sunk off Cape Sable by the English steamer Bosphorus. The schooner had a crew of eleven men; five of them were in the cabin, and, rushing on deck, succeeded in scrambling up the rigging and boarding the steamer just as the schooner was going down. The rest of the men were drowned. This disaster was attributed to carelessness on the part of those keeping watch on board the steamer.

On May 2, 1853, the schooner Ocean Nymph, of Gloucester, was run down by the ship Sarah Jane off Cape Cod, but the crew were saved.

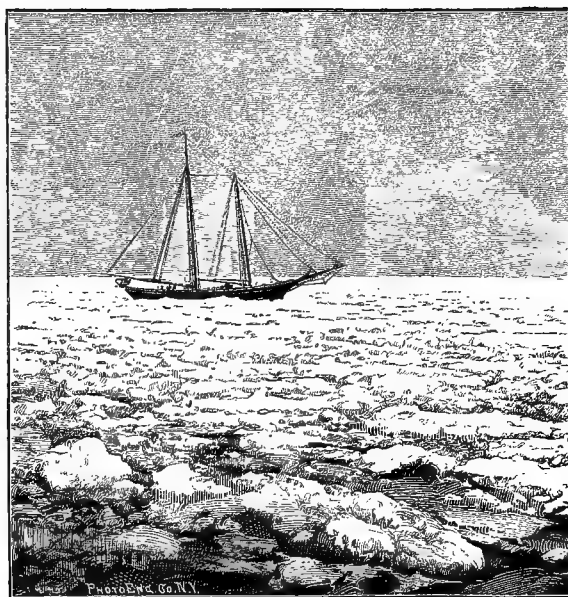
Many other instances might be related where vessels and lives have been lost from collision, and many more in which the vessels were badly injured.

Collisions sometimes occur through gross recklessness, or perhaps purposely in a spirit of retaliation or spite.

Among the vessels engaged in the mackerel fishery, when jigging was the method of capture employed, there was a sharp competition not only between the Provincial and American fleets, but to a still greater extent between vessels from different ports along the American coast, and sometimes among those who were close neighbors at home.

When mackerel were plenty in any one locality, large fleets congregated there, lying in close proximity. At such times each was anxious to secure as great a share of fish as possible, and in the attempt to do this the rights of other vessels were considered of secondary importance. One practice, that of "lee-bowing," as it is called, was often a cause of ill feeling. To "lee-bow" a vessel is to heave to directly under her lee, thus tolling away the fish which are playing alongside, having been attracted by the bait which has already been thrown overboard. The skippers of the vessels thus deprived of fish to which they had the first right, often seek a rather savage revenge. By dint of skillful seamanship they carry away a boom or a boat of their rival without receiving any injury themselves. Such injuries may sometimes be repaired at once, though they may cause the loss of much valuable time spent in port. When from two hundred to four hundred sail of vessels are closely packed together it is not uncommon for many accidents to happen even when they are unintentional, especially when there is a fresh breeze blowing. It is then not unusual for a number of vessels to meet with such minor disasters as the carrying away of mainbooms or bowsprits, and even more serious damage may be inflicted.

One of the many instances of this kind took place off the northern shores of Cape Breton in the fall of 1867. A fleet numbering between two and three hundred sail had collected in the vicinity of Cheticamp, and, as it was late in the fall and the mackerel were moving rapidly on their way from the fishing grounds, it was evident that another chance of catching them during that season was unlikely to present itself. The mackerel bit freely, but would stay only for a short time alongside of the vessels. For this reason the vessels were under way most of the time. The wind blew fresh and the crews were eager to improve this last opportunity for that season. A great many of them were reckless in the extreme. A number of the vessels had their sails torn, their spars carried away, and many were run down and cut nearly to the water's edge. The disabled vessels were obliged to cease fishing and haul out of the fleet for repairs. The loss of the opportunity to fish seemed to be the lesser evil, for they were on a rock-bound coast and far from any



Fishing schooner on the Banks, caught in an ice-floe.

From a photograph.

good harbor. With a sudden change of wind they would have been exposed to the dangers of a lee shore, which, in their disabled condition, would probably have resulted in the loss of the vessel.

DANGERS IN HARBORS.

To a person unacquainted with a seaman's life it might seem probable that vessels in harbor would be free from danger, but this is not always the case. There have been instances of great loss of property, and even of life, in the case of vessels in harbor at the time of the disaster. These losses are sometimes due to the insecurity of the harbors during gales. More especially is this the case if there is a large fleet of fishing vessels at anchor together with coasting vessels, which are not so well provided with cables and anchors. Sometimes a vessel of the latter class will strike adrift, and, coming in contact with others, will be the means of driving them ashore. Many losses of this kind have occurred in the Gulf of Saint Lawrence, where several of the places resorted to by fishermen for shelter are simply "one-sided" harbors, affording protection to the vessels when the wind is in certain directions and are open to other winds. Mention has already been made of losses at Pleasant Bay and Cheticamp, which are two shelters of this class, where many serious disasters have occurred.

On September 8, 1869, a severe hurricane occurred on the New England coast, in which several Gloucester vessels were lost in shelters of this insecure kind. Serious disasters have also taken place at Souris, Prince Edward Island. Many losses have also occurred in harbors thought to be secure. Among these may be mentioned several disasters that have occurred at Port Hood, Cape Breton, Malpeque or Richmond Harbor, Prince Edward Island, and many other harbors along our coast and that of Nova Scotia. Instances of losses occurring in harbors of this kind might be multiplied, but this is probably not necessary, since those interested in the subject can find numerous disasters of this kind recorded in newspapers printed in the large fishing ports.

DANGERS FROM ICE.

DANGERS TO FISHING VESSELS.—The danger from collision with ice is one to which the vessels engaged in the Grand Bank, Newfoundland, Cape North, Labrador, and Greenland fisheries are particularly liable.

In the latter part of winter and in early spring large masses of field ice, as well as many icebergs, drift far south, covering a large extent of the eastern fishing grounds, including Flemish Cap, Grand Bank, Saint Peter's Bank, and Banquereau, and ice has in some seasons extended so far to the westward as to drive the vessels from parts of Western Bank. There are periods of a few years in succession when the fishermen are troubled but little by the floating ice, but there is more or less danger each spring on the Banks, and still more danger while making passages to and from them.

For several weeks in the springs of 1875 and 1876 the whole of Banquereau and Green Bank, part of the Western Bank, and the greater part of the Grand Bank, were covered with immense fields of drifting ice. Many vessels were driven from the fishing grounds and obliged to lay by, waiting for the ice to recede. Several of them were in collision with the ice or it drove foul of them when they were at anchor. Some vessels received considerable damage, their planking being so badly chafed as to necessitate repairs. It is not positively known that any vessels engaged in the Grand Bank fishery met with very serious damage by collision with ice during those seasons, but it is supposed that the loss of the *James L. Shute* and *Janet Middleton*, in the spring of 1876, was caused in this manner. This seems the more probable as the ice, for some weeks about the time they were on their passage to the Grand Bank, was drifted from 75 to 100 miles south of the lati-

tude of Sable Island, and was, therefore, directly in their course. Much of this ice was very heavy, and a collision with it, especially when a vessel was running at great speed, would result in almost certain destruction. Many narrow escapes from disaster occurred to the halibut fleet while on the passage home, but as most of the fishermen were aware of the presence of the ice they generally managed to escape without any serious loss.

Vessels engaged in the Newfoundland herring fishery have been surrounded by field ice for weeks at a time,* while on the passage home, and many thrilling tales are told of such narrow escapes from disaster. Doubtless some of the losses of vessels engaged in this fishery have been the result of collisions with ice, although none of the crews of the missing schooners have been left to tell the story of such disaster.

The vessels engaged in the cod fishery about Cape North, north end of Cape Breton Island, sometimes meet with considerable difficulty from drifting field-ice and are often driven from the fishing ground. In one instance a vessel started her planking by collision with ice in that vicinity so that she sprung a leak, and only by great exertions was kept afloat until she reached a place of safety. More or less difficulty is also experienced by vessels engaged in the Magdalen herring fishery. They encounter drifting ice on their passage to those islands in the spring, and, although we have no accounts of any serious disasters, the immunity from such may be ascribed to the extreme vigilance of the fishermen. Vessels fishing on the Flemish Cap are very much exposed to contact with icebergs even as late as July.

Perhaps no other vessels are so much exposed to danger from ice as the halibut fleet of New England. They meet with many drifting icebergs and, occasionally, with large masses of field-ice, on their route to the northern grounds. In the spring of 1880 several vessels which started for Greenland were obliged to give up the voyage and return to the Grand Bank on this account.

Ice, freezing in masses on the vessel's sails and rigging in extremely cold weather, is, perhaps, more to be dreaded than collision with floating ice.

In the winter season the temperature is often so low that every bit of flying spray congeals wherever it strikes, and the vessels soon become so loaded down that they are almost unmanageable. This is one of the commonest perils of the winter fisheries, and one that requires great fortitude and resolution to overcome. Any neglect to improve every opportunity of freeing the vessel from ice would soon result in her foundering. Sometimes, for days and nights together, the men must remain on deck, constantly employed in pounding the ice and always at the imminent risk of being swept overboard. Vessels sometimes arrive in fishing ports so badly "iced up" that it is impossible to lower the sails or to bring them to an anchor.

DANGERS TO WHALING VESSELS.—On the homeward passage the Arctic whaling vessels, in thick weather, are in constant danger from icebergs, especially about Hudson's Bay, Cumberland Gulf, and Davis Straits. There is less danger on the outward passage, as the "watch on deck" is more eagerly on the lookout. On the homeward voyage, however, when the approach of whales

* *Twenty-four days in the ice.*—Schooners Hereward and Rattler, which left this port for Newfoundland for a load of frozen herring in December last, got frozen in while on the homeward passage, February 9, in Fortune Bay, and remained there eleven days. Got clear the 19th, and went into the ice again the same day and remained there until March 3. Schooners S. C. Noyes, of Newburyport, and Charles A. Ropes, of Camden, Me., were also in the same predicament. Captain Pennington (of the Hereward) made a drawing of the scene, in which the four vessels are visible fast locked in the ice, and the crews of the Hereward and Rattler busily engaged in getting some provisions from the S. C. Noyes, which lay at a distance of 3 miles. The ice was so rough that they were obliged to carry the flour in bags, and the men with the bags on their backs, and the captain with the empty barrel to put it in when it reached the vessel, makes a lively scene. It was a tedious experience for all hands, and glad enough were they to get clear of their icy bonds. Fortunate it was that the Noyes could supply them with flour, otherwise the men would have suffered for this necessary of life.—*Cape Ann Advertiser*, March 17, 1876.

is not so much an object of interest, the lookout is not kept with such vigilance. The greatest precautions against collision with ice are taken from the time the vessels approach the region where they expect to find ice—about the latter part of June—through July, August, and the first part of September.

Vessels engaged in the whale fisheries of the Arctic Sea, north of Bering's Straits, are exposed to great danger from ice, and many of them have been lost, either by being driven on shore by the ice or crushed between masses of heavy pack-ice.

Since 1871 more than fifty whaling vessels have been lost in the Arctic, north of Bering's Straits. In 1871 thirty-four out of a fleet of thirty-nine vessels were crushed in the pack-ice. In 1876 twelve out of a fleet of twenty sail were lost under similar circumstances. The story of the great disaster of 1871 is told by Starbuck, in his *History of the Whale Fishery*. He says: "In the fall of 1871 came news of a terrible disaster to the Arctic fleet, rivaling in its extent the depredations of the rebel cruisers. Off Point Belcher thirty-four vessels lay crushed and mangled in the ice; in Honolulu were over twelve hundred seamen who, by this catastrophe, were shipwrecked. * * * On the 2d of September the brig Comet was caught by the heavy ice and completely crushed, her crew barely escaping to the other vessels. * * * Nothing but ice was visible off-shore, the only clear water being where the fleet lay, and that narrowed to a strip from 200 yards to half a mile in width, and extending from Point Belcher to 2 or 3 miles south of Wainwright Inlet. * * * On the 7th of September the bark Roman, while cutting-in a whale, was caught between two immense floes of ice off Sea Horse Islands, whence she had helplessly drifted, and crushed to atoms, the officers and crew escaping over the ice, saving scarcely anything but their lives. The next day the bark Awashonks met a similar fate, and a third fugitive crew was distributed among the remaining ships." There appeared no chance of relief to the ice-bound vessels, and after consultation among the captains it was agreed to abandon their ships, and a day set when they would take to boats in hopes of reaching other vessels which were outside the barrier. "The morning of the 14th of September came, and a sad day it was to the crews of the ice-bound crafts. At noon the signals, flags at the mastheads, union down, were set, which told them the time had come when they must sever themselves from their vessels. As a stricken family feels when the devouring flames destroy the home which was their shelter, and with it the little souvenirs and priceless memorials which had been so carefully collected and so earnestly treasured, so feels the mariner when compelled to tear himself from the ship which seems to him at once parent, friend, and shelter." After two days' struggling with the ice and waves, the boats, heavily loaded with their freight of 1,200 whalers, reached the more fortunate vessels and were kindly cared for by their fellows. Fortunately no lives were lost by this disaster, though the money loss was upwards of a million and a half of dollars. The loss by the disaster of 1876 was fifty men, and vessels and cargoes valued at \$800,000. Further details of these and other disasters to the Arctic fleet are given in another section of this report, which discusses the history and methods of the whale fishery.

DANGERS FROM FIRE AND LIGHTNING.

Fishing vessels are sometimes exposed to dangers from fire and lightning, which cause many mishaps, if not serious disasters. In June, 1864, a fire broke out in the fore-castle of the schooner *Sea Witch*, at anchor on Cashe's Ledge. It was discovered by the men who were on deck dressing fish. They immediately rushed forward with buckets, and by the most strenuous efforts, exposing themselves the while to the flames, succeeded in extinguishing the fire before any very serious damage had been done. Another instance of this kind occurred to the schooner *Princess*, of

Bucksport, Me., a few years later, while lying in Prospect Harbor, Nova Scotia. All of the crew except the captain had gone to the wreck of the steamer *Atlantic*, a few miles distant from the harbor. The fire broke out in the fore-castle. It was first observed by the crews of some vessels near by, and they proceeded to the rescue. Although the fire was well under way, they succeeded in extinguishing it by cutting holes through the deck, but not before the vessel was badly damaged.

Instances of vessels having been struck by lightning are not at all rare, but as a general thing they are only dismasted or receive some other slight injuries. There are a few cases, also, where some of the crew have been very seriously injured.

DANGERS OF ATTACKS FROM MARINE ANIMALS.

Fishing vessels are liable to attacks from whales and swordfish. In the "History of the Swordfish"* instances are recorded of attacks upon vessels by swordfish. Many of the New England fishermen have their stories of swordfish striking their vessel. A New London fisherman of many years' experience states that there are several broken swords in the hull of his vessel. The danger from these attacks is from leaks, which have sometimes resulted in much damage.

Whales have been known to strike and cause the destruction of merchant and whaling ships, but we have no record of such disaster to fishing craft. "The Fisheries from 1623 to 1876," published at Gloucester, gives the particulars of a vessel of that port being towed by a whale. The fluke of the anchor caught in the blow-hole of the whale, and the frightened animal rushed through the water with the vessel in tow. It became necessary to cut the cable in order to save several of the crew, who were away from the vessel hauling their trawls. In 1878 the ship *Columbia* was sunk off the Newfoundland Banks by a blow from a whale. The crew took to the boats, and were rescued by Captain Deddes, of the steamer *P. Caland*. The story of the loss of the whaleship *Essex* in the southern seas is one of the most familiar in the annals of the whale fishery. "The boats of the *Essex* had killed the calf of a whale, when the mother, apparently understanding their connection with the ship, attacked it, retreating about a mile to get headway, and striking the vessel on the bows, staving in its timbers and making a hole so large that it was useless to attempt to stop the leak." The crew took to the boats, and were finally picked up.

DANGERS FROM THE DEFECTS OF BAD CONSTRUCTION OR FROM AGE.

Although the majority of the fishing vessels are as substantially built as any in the world and are well calculated in this respect to withstand the strains which may be brought to bear upon them; yet unprincipled builders sometimes take advantage, when building a vessel for sale, to slight them in certain particulars. These may be briefly mentioned as—(1) by putting in defective timber or planks; (2) by insufficient fastening; and (3) by a lack of care in calking the vessel.

If to these defects are also added others in the rigging of the vessel, it follows as a matter of course that she is poorly calculated to withstand the vicissitudes and perils incident to the pursuit of the fisheries. Vessels of this kind are sometimes built to be sold at a cheap rate, but such a practice is entirely wrong, for it exposes the lives of many men to the danger of being lost at sea. There should be provision for the legal punishment of those who engage in such nefarious enterprises.

Defects are, however, more frequently to be met with in old vessels, which are in some cases sent to sea as long as it is possible to obtain a crew for them, and it is to be wondered at that more fatal disasters have not resulted from such a practice. There is no doubt that the cause of

* Report U. S. Fish Commissioner, Part VIII, 1880.

the loss of many valuable lives might be traced to this source; and owners who will persist in exposing men to such peril, certainly are deserving of the severest condemnation.

The fisherman, who is called upon to meet many dangers with which each voyage brings him in contact, and for the results from which the owners may not be held responsible, should have at least the security of a staunch and well-rigged vessel.

50. DANGERS TO FISHERMEN ON VESSELS AND IN BOATS.

DANGERS TO FISHERMEN ON VESSELS.

SEAS STRIKING THE DECK.—The most common accident which is liable to occur is caused by heavy seas, which strike the fishermen as they stand upon the deck of a vessel, knocking them down and often inflicting serious injuries.

In the winter of 1877 William Brown, one of the crew of the schooner Howard, of Gloucester, was struck by a sea and severely injured by being knocked against the bows of the dories which were lashed amidships.

In December, 1880, one of the crew of the schooner David A. Story was standing on watch at the bow of the schooner when a heavy sea struck the vessel. To avoid being thrown overboard, he grasped the iron braces of the forward stove funnel. The sea knocked the vessel upon her beam-ends, and when she righted he was found insensible, with his leg broken and several splinters from the fore boom, which had been broken by the force of the sea, driven entirely through the limb.

Instances of this sort might be multiplied, but it is sufficient to say that they occur frequently every winter, and rarely without serious or fatal results to the victims, who are sometimes washed overboard.

DANGERS OF FALLING FROM THE RIGGING.—Another serious danger is that of falling from aloft. This kind of accident, however, occurs less frequently than the former.

Capt. Garret Galvin, in the spring of 1875, fell from the masthead of the schooner Restless, while on the Grand Banks, striking the cable-tier. He received no serious injury. His was a very fortunate escape, for lives are sometimes lost in this way, and a person thus falling rarely escapes with less serious results than the fracture of a limb.

In the spring of 1878 Capt. Joseph Campbell, of Gloucester, fell from the masthead of his vessel, which lay at anchor on the Banks, and was killed. Men sometimes fall from the main boom while engaged in reefing the mainsail. In most cases these accidents are fatal, since at such times the weather is generally too rough to permit their being rescued. Such falls are usually occasioned by a sudden lurching of the vessel, causing the men to lose their hold.

Whalemen sometimes fall from the rigging. Such accidents are usually the result of carelessness on the part of the sailors themselves. At times, while the crew are taking in sail, the canvas wraps itself around a sailor and throws him from the yard. Whether he falls on deck or overboard depends upon the position he occupies on the yard.

DANGERS FROM MOVEMENTS OF THE BOOMS.—Fishermen are sometimes injured by a blow from one of the booms, usually the fore-boom, as it swings from side to side. The injuries are usually to the head, though sometimes the man is further wounded by being knocked upon the deck. It is quite common, also, for them to be thrown overboard by a blow of the boom or by becoming entangled in swinging ropes.

Men are sometimes thrown overboard by a sudden lurch of the vessel. They are generally lost, for at such times it is too rough to lower a boat to rescue them.

DANGER OF BEING WASHED FROM THE BOWSPRIT OR JIB-BOOM.—Another danger is encountered by fishermen while on the bowsprit engaged in furling or reefing the jib. As the vessel plunges up and down, the bowsprit is often completely submerged. It is then very difficult for a man to retain his hold and to prevent being washed off and drowned. The force of the sea added to the resistance of the water to the rapid motion of the plunging vessel brings tremendous power to bear upon any object on the bowsprit.

A remedy for disasters of this class is possible. If, as in the English cutter and some other European vessels, our schooners were provided with two jibs, or rather with a fore-staysail and a small jib, instead of the immense jib which is now commonly in use, in heavy weather the jib could be furled and the men would not be obliged to go outside of the bow to shorten sail. This style of rigging has been introduced to some extent upon the New England pilot-boats and upon the larger class of Nova Scotia schooners, and is quite as applicable to all fishing vessels.

Men going on to a jib-boom to furl the flying jib are liable to be washed overboard, and many instances are on record of disasters of this kind, most of which have resulted in loss of life.

Men also sometimes fall overboard by the parting of the foot-ropes, or by missing their hold during a sudden lurch of the vessel.

DANGERS MET WITH IN HOLDING THE CABLE.—There is danger in connection with "holding the cable" when it is "hove up" or hauled in, either to change the arrangements of the chafing gear or to "weigh the anchor." The sudden rise of a vessel on the crest of a wave may jerk the cable forward and throw the persons who are holding it with much violence over the windlass and into contact with the iron brakes, thus inflicting injuries.

DANGER FROM LIGHTNING.—Vessels are sometimes struck by lightning, their masts shattered, and injuries inflicted to the crew. This sometimes occurs on the Banks, and in 1878 several vessels were thus injured while lying at the wharves at Gloucester.

DANGERS FROM FURNITURE.—Minor accidents are frequent on shipboard. When a vessel is knocked down by a sea the cabin stove may break loose and tumble about, burning some of the men. In the gale of December 9, 1876, such an accident occurred to one of the crew of the schooner Ruth Groves, of Gloucester.

DANGERS FROM CUTS OR BRUISES.—In dressing fish or cutting bait sudden movements of the vessel are likely to cause fishermen to cut their hands. Such accidents, however, are not generally serious, though fingers and thumbs are sometimes sacrificed. When a man is engaged in fishing the least cut or scratch soon becomes a painful sore, for it is impossible to protect the raw surface from the slime and salt with which the hands are constantly in contact. Sometimes painful abscesses, or what are called by the fishermen "gurry sores," are the result. In the summer months fishermen suffer a great annoyance from the stings of "sun-jellies," "sun-squalls," or "sea-nettles," usually of the species *Cyanea arctica*. The tentacles of these animals cling to the lines and seines and the stings of the lasso cells cause the most intense pain at times. On the southern coast even more serious results are caused by contact with the tentacles of the Portuguese man-of-war, which sometimes produces a temporary paralysis of the muscles and always acute suffering. All fishermen protect their hands, when dressing fish, by wearing mittens, but, nevertheless, slime will penetrate between the fibres and get upon the skin. In handling the lines, the fishermen use the so-called "nippers," knitted from woolen yarn. Cots of rubber or wool are used by the mackerel fishermen in order to protect their fingers when fishing with hand-lines; and sometimes they wind yarn around their fingers for the same reason. Almost all of the fishermen upon the Banks are afflicted with small boils (called "Pin-jinnets") upon the forearm, caused by the chafing of the

heavy clothing saturated with salt water and the contact of the cuff of the oil-jacket with the flesh of the wrist.

DANGERS TO FISHERMEN IN SMALL BOATS.

The fishermen in trawling on the Banks usually go out in their dories from one to three miles from the vessel for the trawls, and are exposed to numerous dangers.

CAPSIZED BY HEAVY SEAS.—Boats are capsized either when the men are rowing to and from the vessel, or when they are engaged in hauling or setting the trawls. Pages could be filled with instances of this kind, often resulting in loss of life, and frequently remarkable for examples of heroism on the part of fishermen who have made attempts, at the risk of their own lives, to save their weaker comrades.

"Schooner Neptune's Bride was wrecked at Malcomb's Ledge, Me., September 22, 1860. Twelve of her fourteen men found a watery grave by the swamping of the boat in which they sought to reach the shore. One man, Henry Johnson, was enabled to regain the boat. She was full of water, but fortunately there was a bucket in her, and a coil of rope. With the former he commenced bailing, and by dint of hard labor managed to free her, although she was continually taking in water. A hogshead tub from the vessel had drifted across the boat amidships. This he secured with his rope, and that made the boat ride more easily. When he got tired of bailing the boat he would crawl into the tub, and when that got full of water he would commence bailing the boat again. He knew not whither he was drifting, and became so utterly exhausted that, long ere daylight dawned, he fell asleep. At noon-time a Belfast schooner sighted the craft, bore down to her, and her single passenger was received on board and kindly cared for. One other of the crew, named Marsh, secured a resting place at the foremast-head, where for eighteen hours he endured greater agonies than death could inflict. The surging waters reached to his waist, while the pitiless rain beat upon his unprotected head, and the pangs of thirst and hunger clamored that he should cease the unequal strife and seek oblivion in the seething flood. But the instinct of self-preservation was strong, and he maintained his position until his feet were chafed and raw, and delirium set in. His critical position was at last discovered by two fishermen on Seal Island, and he was taken off and tenderly cared for until reason resumed its throne and he was able to take passage for home."*

CAPSIZED BY WEIGHT OF TRAWL.—There is danger of being upset by the strain on the trawl line, as the dory rises upon the sea when the men are hauling in the line. The line is usually, in such cases, around the trawl-winch, or "hurdy-gurdy," and cannot be slackened quick enough to prevent upsetting the dory.

CAPSIZED BY SHIPPING WATER.—A dory heavily loaded with fish is liable to be upset by shipping a quantity of water which brings the gunwales below the surface. When a boat is upset in this way the men seldom escape from drowning. They are clothed from head to toe in heavy clothing, besides stiff outer clothing of oiled cotton or rubber, and with heavy boots, so that they have little power of movement in the water. In addition to this the water is extremely cold on the Banks, in summer being rarely above 40° or 42°, and in winter nearly at the freezing point; the unfortunate fishermen become so chilled that they are incapable of much exertion. Of late years the Gloucester fishermen have adopted the custom of fitting the dories with "plug beckets," which are loops of rope fastened to the under side of the plug in the bottom of the dory. This loop, or "becket," is large enough for a man to thrust his arm through, and he can thus cling to the bottom of the boat until help may reach him. A "life-line" is also occasionally used. This is

* Gloucester and its Fisheries, pp. 66, 67.

a light rope stretched along the bottom of the dory nearly from stem to stern, being fastened at each end and in the middle to small staples, and with two or three "beckets" large enough for a man's arm. These are preferable to the "plug-beckets" because they enable two or three men to cling to the bottom of one dory, which is sufficiently buoyant to support them without difficulty, but not to allow them to rest upon it. Numerous instances of the preservation of life by the use of this simple means are on record, and it is simple inhumanity to send men away from the vessel in dories which are not equipped with some such means of safety, for it is almost impossible for a fisherman to retain hold of the smooth slippery bottom of a capsized dory, constantly swept by the breaking seas. The "life-line" was introduced a few years ago, but the "plug-becket" has been in use 10 or 15 years, though not to much extent until recently. These ropes do not impede the speed of the dory, and the only objection ever urged against them is that they interfere with sliding the dories about on the decks of the vessels.

WASHED FROM THE BOAT.—The fishermen are quite often washed out of their dories by breaking seas. In the fall of 1880 Thomas R. Lee, of Gloucester, while engaged in hauling a halibut trawl on the Grand Bank, was struck by a sea and thrown 15 or 20 feet from his dory. He rose to the surface twice, but was so much encumbered by his clothing that he was unable to swim. As he was sinking the third time he caught the trawl, which was fastened to the dory. By means of this he tried to haul himself up, but when still about three fathoms under water one of the hooks caught in his finger and went completely through it. He then grasped the trawl above his head with the other hand and by a sudden jerk tore the hook from his finger. He hauled himself up and reached the gunwale, but just then another hook caught in his clothing, which rendered it difficult for him to get into the boat. He called to his dorymate for help, but the man was too frightened to assist him. By a great effort he pulled himself over the side of the dory and fell down exhausted. This is an instance of the dogged pluck of the typical Gloucester fisherman, for after recovering from the first exhaustion he persisted in hauling his trawl and filling his dory with fish before returning to the vessel.

DANGER FROM SQUALLS.—While tending their trawls fishermen are liable to be overtaken by heavy squalls, especially in the winter season, and are unable to reach their vessels. Such squalls are particularly dangerous because of the force of the wind, which creates high seas, and they are often accompanied with dense snow, which adds to the anxiety and peril. Instances of this kind are constantly occurring, and afford some of the most exciting episodes in the fisherman's life, since, in every instance, a determined and heroic effort is made to regain the vessel in spite of the wind and sea. Their efforts are often aided by their shipmates on the vessel, who fasten a line to a dory or buoy and allow it to drift out to the men who are struggling to reach the vessel. Sometimes over a mile of rope is paid out in this manner, which expedient has resulted in the saving of numerous lives. When that is not available the cable has sometimes been cut or the anchor broken out by putting sail on the vessel, which then runs down toward the dory and rescues the men. At night a light is sometimes rigged to the paid-out dory. When all these expedients fail the lost fishermen may be rescued by other vessels in the neighborhood, but too often they drift about for several days before being picked up. Fishermen have been thus adrift for six days without food or water and finally rescued, and many more have perished after drifting for a long time or have been soon swamped by the breaking waves. When fishermen are thus adrift and exposed to heavy seas they may succeed in keeping the dory afloat by means of rigging a "drag," a contrivance by which the head of the dory is kept to the wind and sea, and it is thus prevented from swamping. This "drag" is often made of the body of a dead halibut by tying it by the head and tail. A buoy keg, with a hole in it, which will fill with water and thus present a



*A Struggle for Life
Caught & Saved in a Squall.*

Dory crew of halibut fishermen caught to leeward in a squall; trawl buoy and line drifted astern for their rescue

Drawing by H. W. Elliott and Capt. J. W. Collins.

H. W. Elliott
Capt. J. W. Collins

resistance to the sea, is also used with the same result. The men meanwhile steady the boat with their oars to prevent it from swinging "side to the wind."

PRECAUTIONS AGAINST LOSS OF LIFE.—Much suffering and loss of life might be prevented if the fishermen would carry food and water in their dories when they go out to haul the trawls. So many vessels are passing daily in the vicinity of the fishing grounds that the chances are against a boat drifting for many days without being picked up, provided the men are able to keep up their strength and spirits. Many of the banks are so near the land that the men could succeed in reaching it if they had provisions to support their strength for a few days. The custom of carrying water and occasionally provisions in the dories in thick weather is, it is claimed, coming more into favor, but this simple precaution against disaster and suffering should be insisted upon by humane public sentiment, and possibly also by legal enactment.

It has been suggested that it would be useless to make laws for the government of fishermen when they are out of sight of the officers of the law, but no matter how careless the crew and skipper may be, if a law allowed the fishermen to bring a suit for damages against the master and owners of a vessel which sent them out in a small boat without provisions, it would be clearly to the interest of the latter to oblige them to carry the necessities of life, no matter how careless the men themselves might be.

John Maynard, of New London, and William Corthell, of Lyme, Conn., of schooner *Gilson Carman*, left that vessel on George's on Wednesday, March 17, 1869, in a dory, to haul their trawls, and while doing so a very heavy thunder-squall sprang up, driving them from the banks. They had at the time several halibut and from sixty to seventy codfish, which they had to throw overboard, with the exception of one, which they retained to eat. After eating a little it made them sick, and they were obliged to throw it away. On Thursday night they saw a vessel, but were unable to attract her attention; were drifted about all day Friday and Friday night, without anything to eat. On Saturday morning a duck lit in the vicinity of the boat, which they managed to kill and ate it raw. On Saturday night, when they had nearly given up the idea of being saved, they made a light a few miles ahead. They immediately pulled for it, when it proved to be the schooner *Henry Clay*. During the time they were in the boat they had a steady storm of rain and snow and were frequently capsized, but with the aid of a bucket they managed to keep the boat clear of water. Corthell had his feet badly frozen. Maynard's arm was badly chafed and swollen, and both suffered greatly.*

"The Dominion Government steamer *Newfield*, Captain Guilford, arrived at Halifax from Sable Island to-day, and brought up William Coleman and James McGrath, who had landed on the island. The two men belonged to the fishing schooner *Procter Brothers*, of Gloucester, Mass. They left the vessel in a dory on the western banks of Newfoundland on the morning of Sunday, April 18, to attend to their trawls. While at this work a gale sprang up, and they were unable to get back to the vessel. For five days they drifted about at the mercy of wind and waves, without food or water. Their sufferings were intense, as the weather was very cold. McGrath had both feet badly frozen. On the evening of Tuesday, April 22, their dory drifted ashore on Sable Island, and the two men are kindly cared for by the men stationed there to aid wrecked people."†

DANGERS OF FOG OR THICK WEATHER.—There is constant danger, at all seasons of the year, of fishermen, while out in the boats, losing sight of the vessels. In summer, when there is no snow, the fogs are most prevalent. To prevent accidents of this sort, so far as possible, vessels are provided with bells, horns, and guns. The common tin horn and Anderson's patent horn, in which the air is forced through a reed by a piston, are the most common horns in use. Occasionally the

* Gloucester and its Fisheries, p. 66.

† Boston Herald, April 30, 1880.

old-fashioned conch-shell horn is carried, and this is considered by many experienced fishermen superior to the tin horn. Some vessels carry muskets and a few of them small cannon. The firing of cannon is so expensive and dangerous that they can only be used in an emergency, and they are not generally fired until too late to be of any assistance to the men who are astray. It is estimated that an ordinary horn can be heard in calm weather from 1 mile to 1½ miles; with an ordinary breeze it can be heard to the windward perhaps not 200 yards, to the leeward perhaps a mile; but in much of the weather in which fishermen are out hauling their trawls such a horn cannot be heard to a greater distance than one-quarter the length of one of their trawl-lines.

An objection to the Anderson piston horn is that it gets so easily out of repair that sometimes, after being used for a few hours, it is of no further service until it has been overhauled.

There are very serious objections to the use of the mouth horn. The labor of blowing this devolves upon the skipper, who remains on board the vessel, and is obliged to keep blowing from morning until night, in order that the boats may keep within a safe distance of the vessel. This continual blowing is very exhausting, so that the skipper's power to aid his men is very much diminished at the close of the day, when the sound of his horn is generally most needed. Some device by which a succession of loud blasts, at frequent intervals, can be kept up on board of the vessels, especially some horn which can be worked without the aid of the human lungs, and powerful enough to be heard a long distance, would be of the greatest importance to our fishermen, as well as to sea-faring men of all classes and nations.

Much of the danger incurred by the thickness of the fog preventing the men in the dories from seeing their vessel may be averted by the use of a compass in each dory. Although this custom has been growing in favor within the last ten years, yet probably not more than one-half of the dories belonging to Gloucester vessels are provided with this instrument, and the proportion in vessels from other ports is very much less. It seems culpable negligence on the part of the owners not to provide compasses for their crews, since the cost of an instrument sufficiently accurate to answer every purpose does not exceed \$3. It is a fair question whether they should not be obliged by law to furnish such additional safeguards to prevent suffering and loss of life. It should be mentioned in this connection that where compasses are used they are in every instance furnished by the crews, and not by the owners of the vessels.* Fifty-two men were reported to have gone astray, from Gloucester vessels, in about two months, in the spring and early summer of 1883.

DANGERS FROM COLLISION.—There is danger, in foggy weather, of a dory being run down by steamers or passing vessels, though disaster can usually be avoided by cutting the trawl or anchor line. Dories are sometimes capsized by heavy seas when unloading their fish and gear alongside the vessel. The manner of setting trawls under sail is described in the chapter on the halibut fishery. This is the only method of setting trawls in the haddock winter fishery. As the vessel under sail approaches the dories to pick them up, there is a danger of the man at the wheel miscalculating the exact distance, and, striking the dory, of upsetting her. Many instances of this kind are recorded. Seine boats, with ten or twelve men on board, have been upset in this way, though loss of life has not been frequent as a result of such accidents.

DANGER OF THE UPSETTING OF SMALL BOATS WHEN UNDER SAIL.—This is a not uncommon cause of loss of life, not so much in the case of the Bank fishermen in their dories as in the shore fisheries, often carried on in sail boats by men who are reckless in their management.

* LOST IN THE FOG.—James Burke and Henry Fitzgerald, of schooner E. B. Phillips, from Le Have Bank, 14th, left their vessel at 4 p. m. New Year's day. A thick fog setting in, they were not able to regain her, and they rowed all night and the next day, when, at 6 o'clock, they were fortunate enough to get alongside schooner Tragabigzanda, where they got something to eat, and, taking a fresh start after getting rested, reached their own vessel at midnight, after having been absent thirty-six hours.—*Cape Ann Advertiser*, January 21, 1876.

DANGER FROM DRIFTING ICE.—During the latter part of winter and in early spring the halibut catchers on the Grand Bank and Banquereau are in danger of drifting ice, which may separate the dories from the vessels. In the spring of 1875 several dories got astray in this way, though they were afterwards picked up and the men were returned to their vessels or brought into port.

DANGERS OF BEING BLOWN OUT TO SEA.—The liability of fishermen, who are engaged in the shore fisheries in small boats or dories, to be blown off to sea by sudden and high winds is a danger to which this class are especially exposed. Instances of fatal results from this cause are not uncommon in most of the fishing communities, and narrow escapes from perilous positions have been frequently recorded. A mishap of this very kind is vividly described in Celia Thaxter's "Isles of Shoals":

"One of the most hideous experiences I ever heard befell a young Norwegian now living at the Shoals. He and a young companion came out from Portsmouth to set their trawl, in the winter fishing, two years ago. Before they reached the island, came a sudden squall of wind and snow, chilling and blinding. In a few moments they knew not where they were, and the wind continued to sweep them away. Presently they found themselves under the lee of White Island Head; they threw out the road-lines of their trawl, in desperate hope that they might hold the boat till the squall abated. The keepers at the light-house saw the poor fellows, but were powerless to help them. Alas! the road-lines soon broke, and the little boat was swept off again, they knew not whither. Night came down upon them, tossed on that terrible black sea; the snow ceased, the clouds flew before the deadly cold northwest wind; the thermometer sank below zero. One of the men died before morning; the other, alone with the dead man, was still driven on and on before the pitiless gale. He had no cap nor mittens; had lost both. He bailed the boat incessantly, for the sea broke over him the livelong time. He told me the story himself. He looked down at the awful face of his dead friend and thought 'how soon he should be like him'; but still he never ceased bailing—it was all he could do. Before night he passed Cape Cod and knew it as he rushed by. Another unspeakably awful night, and the gale abated no whit. Next morning he was almost gone from cold, fatigue, and hunger. His eyes were so swollen he could hardly see; but afar off, shining whiter than silver in the sun, the sails of a large schooner appeared at the edge of the fearful wilderness. He managed to hoist a bit of old canvas on an oar. He was then not far from Holmes' Hole, nearly two hundred miles from the Shoals! The schooner saw it and bore down for him, but the sea was running so high that he expected to be swamped every instant. As she swept past, they threw from the deck a rope with a loop at the end, tied with a bow-line knot that would not slip. It caught him over the head, and, clutching it at his throat with both hands, in an instant he found himself in the sea among the ice-cold, furious waves, drawn towards the vessel with all the strength of her crew. Just before he emerged he heard the captain shout, 'We've lost him!' Ah, the bitter moment! For a horrible fear struck through him that they might lose their hold an instant on the rope, and then he knew it would be all over. But they saved him. The boat, with the dead man in it all alone, went tossing, heaven knows where."

An early accident of this kind is recorded by a chronicler of colonial history:

"In January, 1641, a shallop, with eight men, would go from Piscataqua (though advised to the contrary), on the Lord's day, towards Pemaquid, but were by the northwest wind driven to sea for fourteen days; at length they reached Monhegin, and four of them in this time perished with the cold."

DANGER FROM DROWNING.—In considering the various dangers to which the fishermen are exposed by the upsetting of boats and by being thrown overboard, it is well to remember that the men have little chance of saving themselves by swimming, however expert they may be.

Overloaded, as they are, with thick clothing, rendered doubly heavy by saturation, they have comparatively very little use of their limbs, and, besides, the water is so cold that their muscles would soon become paralyzed. The majority of New England fishermen are completely ignorant of the art of swimming; in fact, the ability to swim is not considered by them to be of any special importance, as it scarcely increases their chances for safety. In talking with fishermen upon the subject they will refer to instances which have fallen under their observation of two men in a boat, one of whom could swim and the other could not. The former, trusting to his skill when the boat was capsized, attempted to swim to a place of safety and was drowned, while the other, clinging to the boat, was rescued unharmed.

PRECAUTIONS, ACTUAL OR POSSIBLE, FOR THE SAFETY OF LIFE.—Strange to say, there are rarely any provisions on our fishing fleet for the succor of those who are overturned into the water. If fishing vessels, like merchant and other vessels, could be compelled by law to carry life-buoys or preservers, many lives might yearly be saved. This law might be enforced much in the same way as has already been suggested for the provision of life-ropes and eatables upon the fishing dories. A small outlay by the owners of the fishing vessels to provide such simple safety apparatus as would be needed by a vessel and its crew of twelve or fifteen men, would yield results of immense importance in the way of preserving valuable lives.

DANGERS OF SALMON-FISHING IN THE COLUMBIA RIVER.—As the salmon have become less abundant up the river, the men go farther down, and now the best fishing is found near the bar at the river's mouth, where the breakers are very dangerous, especially in the spring.

Many of the fishermen are drunk or asleep in the bottom of the boat when it nears the bar, and hence lose their lives. Often, too, sober and skillful men take dangerous risks for the sake of a good catch. Sometimes miscalculations as to wind and tide result in the boats being driven into the breakers, where they are swamped at once.

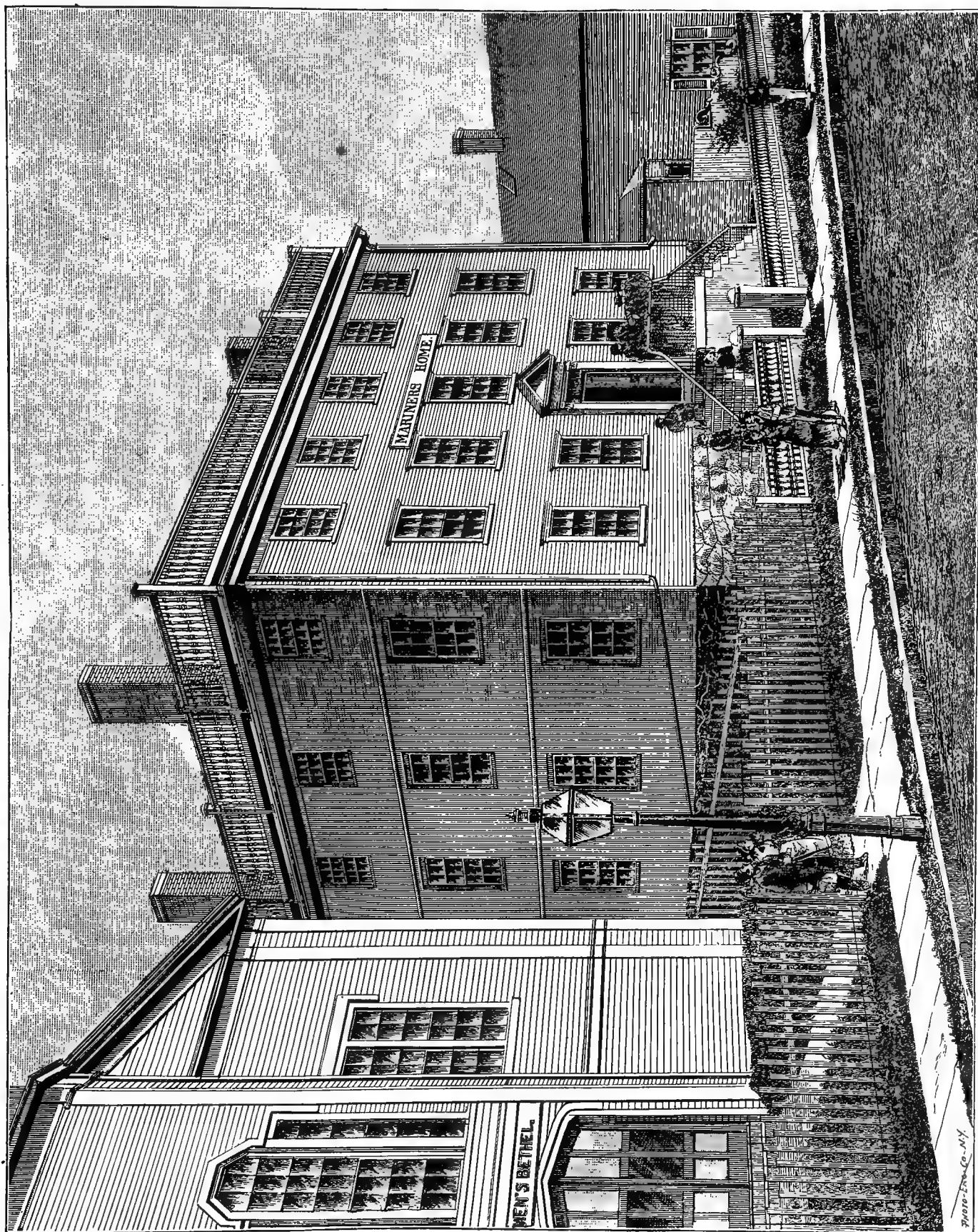
In stormy weather, for various reasons, some men are drowned almost every night. In 1879 about forty men were drowned, and more than that number in April and May of 1880. Little outside notice is taken of these accidents. Most of the fishermen are foreigners, without family or friends, and, unless their bodies are taken in gill-nets, when drowned they drift out to sea and the boat is reported as missing.

DANGERS TO WHALEMEN AND SEALERS.—The whaleboats sent out from the vessels to kill and secure the whales are often struck by the whale's flukes, and many whalers have lost their lives at such times. Sometimes the men are caught by a foul line and being carried overboard are drowned. Men engaged in the fur-seal and sea-elephant fisheries have lost their lives by the capsizing of the boats while making a landing on the rocky shores of the seal islands. In the description of the whale and seal fisheries, in another section of this report, numerous instances of these and other dangers to whalers and sealers are more fully discussed.

51. PROVISION FOR THE BEREAVED FAMILIES OF FISHERMEN.

The nature and extent of the disasters to which our fishermen are constantly exposed having been considered, it is of interest to know what systematic efforts are made for the relief of their families when, as is usually the case, they are left without adequate means of support.

Private benevolence and the organized charity of the different religious denominations have been found sufficient for the needs in this respect of many of the smaller fishing communities. In the larger ports private charity is very extensively practiced, notwithstanding the existence of various charitable organizations.



Seamen's Bethel and Mariner's Home at New Bedford, Mass.

From a photograph by U. S. Fish Commission.

In Gloucester, subscription lists are often circulated, musical and literary entertainments are given, and benefit balls are organized by the friends of impoverished families.*

On the occasion of extensive disasters, such as occurred in 1862 and 1879, large subscriptions have been made both in Gloucester and in other cities. The contributions through various sources for the relief of sufferers at Gloucester after the great losses of February, 1879, amounted to about \$30,000.

Many fishermen belong to such organizations as the Masonic fraternity, the Odd-Fellows, and the Knights of Pythias; and in some communities the systems of assurance and mutual help thus provided are called into much activity. A large percentage of the native-born fishermen are probably Freemasons. In Gloucester there are two lodges of Freemasons, and in Provincetown, at Boothbay, Me., and at other ports on the coast of Maine this organization is large and influential.

There is no doubt that if the town records of the early days were searched many instances might be found of especial provisions for individual cases like that in the law here quoted, which, though not directly to the point, illustrates the usage of the colonies in the seventeenth century:

"Att the Generall Court of his Ma^{tie} held att Plymouth, on the 4th of October, 1675.

"This court, being informed of the low condition of Apthya, the relict of John Knowles, of Eastham, whoe was lately slayne in the collonies seruice, towards the releiffe and support of the said widdow and her children, haue ordered to receiue ten pounds out of the proffitts of the fishing att Cape Codd, wherof five pounds to be payed to her this yeer, and the other five the next yeer."†

One of the earliest instances of public aid to fishermen's families, of which record has been found, was in 1771, when the provincial government of Massachusetts placed in the hands of a committee the sum of £118 for distribution among the families left destitute by the destruction of twenty-nine vessels in a storm on the Grand Bank.

Charitable societies have been organized at various times and places. Such was the Marine Society of Newburyport, which had, in 1861, funds to the amount of \$26,000, mostly the contributions and legacies of sea captains. Among its beneficiaries at that time were said to be some of the most respectable people of Newburyport, superannuated seamen, widows, and children. The fishing interests of this town have of late declined to such an extent that there is no need of such a society except to continue its past benefactions.

Wellfleet, in its days of importance as a fishing port, supported a charitable organization called "Wellfleet Marine Benevolent Society." In 1861 this society had a reserve fund of \$3,000.‡

At Portland, Me., there are no organizations to provide for the fishermen's widows and orphans, but the masters of merchant vessels are cared for by the Marine Charitable Society. The comparatively rare cases of destitution among fishermen here, as in many other fishing ports, are provided for by the town poor laws.

In some of the largest fishing ports, such as Gloucester, where the frequent recurrence of disasters is so extensive as to be practically beyond the reach of individual or extemporaneous efforts for relief, charitable societies have been organized, but we cannot learn that any are now particularly active outside of Gloucester.

* A MERITORIOUS ACT.—Capt. Ezekiel Call, who was lost in the schooner William Murray during the severe gale of April 2, 1871, left a widow and five small children. Soon after his loss she was presented with a house-lot at Riverdale, and her relatives and friends signified their intention of building a house thereon and making her a present of it. The money for the lumber was raised by subscription, the cellar dug and stoned by willing hands; then followed the carpentry work, painting, &c., all done by volunteers. The house was ready for occupancy in the spring of 1873, and the thanks of the widow and the fatherless will descend as a benediction upon the hearts of those who assisted in its erection either by money or labor.—*Cape Ann Advertiser*, 1873.

†Plymouth Colony Records, Vol. V, 1668-1678, p. 177.

‡Provincetown Advocate, Jan. 25, 1871.—"A notice of the annual meeting in the Methodist church Jan. 17."

The most important and most efficient of these is the Gloucester Fishermen's and Seamen's Widows and Orphans Aid Society. This was first organized in March, 1862, as the Widows and Orphans Fund Society, and since that date the yearly collections have been as follows: 1862, \$18,544; 1863, \$155; 1864, \$7,500; 1865, \$4,001; 1866, \$4,913; 1867, \$3,546; 1868, \$4,556; 1869, \$4,897; 1870, \$4,420; 1871, \$4,020; 1872, \$4,220; 1873, \$5,485; 1874, \$5,192; 1875, \$5,120; 1876, \$4,605; 1877, \$4,860; 1878, \$3,252; 1879, \$18,559; 1880, \$3,550; 1881, \$3,900. Total receipts to 1881, \$115,895. Funds held by the society (invested) at close of season, 1881, \$20,500. Total expenditure in nineteen years, \$95,395.

In 1862 the money was raised by public subscription. The terrible gales in January and February of that year resulted in a loss to Gloucester of twenty vessels and one hundred and forty men, leaving seventy-five widows and one hundred and sixty fatherless children needing aid. A meeting of the citizens was held in the Town Hall and a committee appointed to distribute circulars stating the facts and calling for subscriptions. In response to this call money was received from various parts of the country, a generous citizen of Salem contributing \$500; in other cities and towns upwards of \$10,000 was raised; and the people of Gloucester contributed more than \$5,000. About \$8,000 of the receipts of the society that year were disbursed for the immediate relief of sufferers, and the balance held as a fund for future needs.

The following year, 1863, efforts were made to induce fishermen to join the society, and certificates were issued at \$1 each which entitled their families to receive benefit in case the one paying for the certificate should be lost. Owing to the superstitions of the fishermen this plan was not very successful, only about one hundred and fifty of them being induced to buy the certificates. In March, 1865, the society was reorganized under its present name, and established on a permanent basis. An attempt was made at this time to induce the fishermen to become life members by the payment of \$10 each, but this plan met with no greater favor than selling certificates.

The most successful plan for raising money, and the one still in force, was first attempted in 1864. By this method an assessment of $\frac{1}{2}$ of 1 per cent. is made on the earnings of the fishermen. This amount is deducted from the fisherman's share at the settling up of each trip, and the total collections of the season are handed over to the society by the fishing firms at the end of each year. Additional amounts are received from private contributions. The large collections of 1879 were very largely from outside sources. Several other aid societies were organized in that year, and their total collections reached nearly \$30,000. From \$5,000 to \$6,000 are now annually disbursed by the Widows and Orphans Aid Society, a widow with three or four children receiving \$50, and smaller families about \$30. Besides allowances of money, clothing and fuel to the amount of \$75 to \$125 per family are distributed. The number of families receiving aid in 1874 was 120; in 1875, 135; in 1876, 136; in 1877, 157; in 1878, 134; in 1879, 208; in 1880, 193.

The financial report of this society for 1879 shows contributions from abroad amounting to \$14,353.83; by legacy, \$437.25; from fishing firms and other Gloucester subscribers for 1879, \$2,705.07; from interest, back subscriptions, and other sources, \$2,397.78; total receipts, \$19,893.93. The amount paid out in cash allowances was \$5,351.53; for fuel, \$1,082.35; for clothing and shoes, \$378.41; provisions, \$664.79; aid to Rockport families, \$325; paid balance due treasurer, \$965.80; expenses, \$310.77; invested, \$9,000; cash on hand, \$1,815.28; total, \$19,893.93. The number of families assisted was 208, of which number 109 were added during the year. There were 22 packages of clothing received and 860 garments distributed during the year.

The annual report for 1880 shows receipts—from a friend, \$500; from fishing firms for 1880, \$1,771.85; from back subscriptions, interest and other sources, \$4,675.96; total receipts, including cash on hand (\$1,815.28) at beginning of year, \$8,763.09. The disbursements were—in allowances

of cash, \$5,623.09; in fuel, \$1,165.24; provisions, \$213.06; clothing and shoes, \$258.12; amount loaned, \$500; paid for books, printing, &c., \$17.42; for treasurer and collector, \$250; cash on hand, \$736.16. The number of families receiving assistance during the year was 193, and the number taken off the list during the year was 38.

Gloucester has three other charitable societies, one of which, the Tenement Association for Widows and Orphans, was organized in 1871. Its object is "to furnish, at moderate rate, homes for the widows of our lost fishermen." It has erected, at a cost of \$7,500, a building containing ten tenements. This is a neat structure in the western part of the city, on "The Meadows." It was, unfortunately, not built in a sufficiently central location and has not fully served the purpose for which it was intended. The poor women are obliged to work for their living and this tenement is too remote from the busy part of the town.

The Gloucester Female Charitable Association was organized in 1834, for the purpose of assisting the poor. Its funds are derived from annual memberships and donations. In 1875 it aided 126 families, most of which were those of fishermen. The financial report of this society for the year 1879 shows receipts from contributions, \$4,182.02; from assessments, interest, &c., \$254.50; cash on hand at beginning of year, \$36.27; total, \$4,472.79. The disbursements for the same year were as follows: For groceries, \$601.05; for dry goods, \$307.53; for shoes, \$541.50; for fuel, stoves, meat, milk, &c., \$499.03; invested, \$2,500; cash on hand, \$23.68; total, \$4,472.79. The number of garments distributed for the year was 1,145.

The Gloucester Relief Association was organized in 1877 for the relief of the deserving poor of that city. It had no accumulated fund, but depended upon voluntary contributions of the benevolent to meet the pressing demands constantly made upon its charity. It has no salaried officers. After the disastrous gale of February 20, 1879, the association made an appeal to its earlier beneficiaries and to the charitable public for the relief of the 53 widows and 149 children thus left dependent upon charity. The appeal was nobly responded to, the amount collected being \$6,846.04. Of this amount \$6,496.37 was distributed to the needy, and the balance in the treasurer's hands in March, 1881, was \$349.67. Besides the contributions of money, the association received large quantities of clothing and provisions, which were given to the families of the fishermen. It is intended to make the association a permanent one, as there is constant need of its kindly services.

Apart from the organized charitable associations, much good work is done at Gloucester in a more private way. What is known as the Cape Ann Advertiser Fund was contributed by subscribers of that paper for the relief of sufferers by the gales of February and March, 1879. This fund amounted to \$671.59 and was the means of doing much good. At the same period the Boston Theater Company sent a generous donation of money to Gloucester, which was disbursed by the mayor, assisted by citizens. Collections have been taken in Gloucester churches from time to time for the relief of suffering families of lost fishermen, and donations are frequently received by Gloucester ministers from benevolent persons in other places.

E.—MANAGEMENT OF THE VESSELS.

By JOSEPH W. COLLINS.

52. EVOLUTIONS OF THE FISHING SCHOONER.*

There are numerous evolutions to be performed in conforming the movements of the vessel to the changes of the wind; also, in changing her course, and in making those maneuvers incidental to fishing which are peculiar to the New England fishermen, whose methods of seamanship are in many respects very different from those elsewhere in use.

These evolutions may be discussed under the following heads: (1) tacking, or coming about; (2) jibing, or wearing; (3) boxhauling, or hauling around; (4) shooting to; (5) heaving to, or lying to; (6) bringing a vessel to an anchor; (7) bringing a vessel to a drag; (8) getting under way; (9) breaking out anchor under sail; (10) shooting alongside of a seine-boat; (11) shooting alongside of a dory; (12) shooting alongside of a wharf; (13) lee-bowing another vessel; (14) running a vessel upon a lee shore; (15) jumping a vessel off a ledge on a lee shore.

TACKING, OR COMING ABOUT.

The act of tacking a fishing vessel is precisely the same as with any other fore and aft rigged vessel. This is done by putting down the helm and making fast the jib-sheet to leeward, so that, as the vessel comes to the wind, the jib will take aback and cause her to fall off in the opposite direction. To tack an ordinary fishing schooner takes from forty to eighty seconds, the time varying with the strength of the wind, the force of the waves, and the peculiarities of the vessel. The only danger in this evolution is that of "missing stays" when the vessel is in a dangerous place on a lee shore or in a narrow channel. Fishing vessels very rarely miss stays. The orders for tacking are: (i) *Stand by for stays*; (ii) *Tend the jibs* (this means to put the "tail-rope" on the jib-sheets, and if the vessel carries a flying-jib, to slacken the lee sheet and stand by to trim down on the other sheet as the vessel comes around); and (iii) *Let her come round*; to which the man at the wheel answers: *Hard-a-lee*, as he puts his helm down.

JIBING, OR WEARING.

This evolution on a fishing schooner is the same in principle, as on other sailing vessels. It is precisely the opposite of tacking, the direction of the vessel being changed while running before the wind, so that the stern rather than the bow crosses its direction. With a moderate wind the act of jibing occupies but a few seconds, but when the wind is strong and the sheets must be hauled in and gradually slackened out on the opposite side, it may take from ten to twenty minutes. The orders for jibing are as follows: (a) *With light winds*, (i) *Put the wheel up and let her jibe over* (to the man at the wheel). As the direction of the vessel is changed the wind catches the sails aback, and of their own accord they pass over to the other side of the vessel.† The flying-jib sheets are properly adjusted in obedience to the order, (ii) *Draw away the flying-jib*. (b) *With stronger winds*. When running before the wind with a fresh breeze a schooner usually has a boom-

* This chapter, as well as that which follows, might very properly be included in the description of the fishing schooner, but as it illustrates the duties of the fishermen under certain conditions, we have thought it proper to publish it in this place.

† This is called "jibing all standing," or "North River jibe," and is common on the Hudson River.

tackle, which is attached to the main boom and hauled taut to prevent the boom from swinging in when the vessel lurches in a sea. The orders are, (i) *Call all hands to jibe the mainsail*. This order is given to one man, who calls to the men in the fore-castle, *Stand by to jibe the mainsail; all hands on deck*. The skipper usually repeats the same order to the men in the cabin. (ii) *Unhook the boom-tackle*. When necessary to jibe in this manner the vessel is usually running winged out, with the foresail on the opposite side to the mainsail; but if not, it may be necessary to haul aft on the fore-sheet and jibe it over before the mainsail is jibed. In this case the order is, (iii) *Gather aft on your fore-sheet and jibe the foresail*. After the foresail is jibed over, and the boom-tackle has been unhooked, the order is, (iv) *Haul aft the main sheet*. When the main sheet is sufficiently flat, the order is given, (v) *Take a turn with your main-sheet*, and a round turn is taken on the cavit. The next order is to the man at the wheel, (vi) *Put up your wheel and let her come over*. The vessel having changed her course, and the wind catching on the opposite side of the sail, the next order is, (vii) *Slack off the main sheet and hook on the boom-tackle*. The boom-tackle is now hooked on and hauled taut; the lee flying-jib-sheet is then hauled taut in obedience to the order, (viii) *Draw away your jibs*, and the vessel pursues her way upon a new course. When the vessel has been sailing wing and wing it is not usually necessary to jibe the foresail, that being already on the proper side; but when it is necessary, after jibing the mainsail, to wing the foresail out on the other side, this is generally done in obedience to the orders, (i) *Wing out the foresail on the other side*. When the foresail is winged out, the fore-boom is usually held in position by a guy, which answers the same purpose as the boom-tackle on the main boom. One end of the guy is fastened to the end of the boom, and the other taken to the bow of the vessel. The next order is, (ii) *Slack up the fore-boom guy and haul aft the fore-sheet*. The helmsman is cautioned by the order, (iii) *Be careful how you steer, and don't let her come over too quick*. When the fore-sheet is sufficiently flat, the next order is, (iv) *Take a turn with your sheet*; and the helmsman is then directed to, (v) *Let it come over*. As the sail catches full on the opposite side, the order is, (vi) *Slack away on the fore-sheet and haul taut the fore-boom guy*.

There is considerable danger attendant upon jibing when there is a fresh breeze, and booms are sometimes broken or even the masts are carried away. For this reason it is quite common for vessels to tack when the breeze is fresh instead of "wearing round," although it is necessary in this case to make nearly an entire circle and thus take much more time for the evolution. In order to avoid accidents when jibing, it is customary for some to slacken down the peaks of the foresail or mainsail, or both, so that less strain will be brought to bear on the ends of the booms and on the mastheads. This, however, involves the danger of "goosewinging" the sails.

BOXHAULING OR "HAULING ROUND."

This evolution differs entirely from that performed by a square-rigged vessel and called by the same name. It is generally done on a fishing vessel after she has been lying to under a foresail and mainsail, in order to get her upon the opposite tack without the necessity of setting more sail and gathering headway. In order to understand this evolution it may be stated that when a vessel is lying to in this manner, the main boom is guyed out broad over her quarter by the boom-tackle, and the fore-sheet is eased off slack, so that the sail holds no wind, and the wheel is hard down. The vessel is governed by her mainsail and the action of the helm, lying with her head within four or five points of the direction of the wind and drifting to leeward. When it is necessary to boxhaul, the order is given, (i) *Haul aft the fore-sheet*. This is pulled in sufficiently, when the order is, (ii) *Make fast fore-sheet, unhook the boom-tackle, and haul round*. The main sheet is now hauled aft rapidly, the helm being still kept down, and as the vessel comes nearly head to

the wind the order is, (iii) *Stand by to hoist the jib*. When the vessel is head to the wind the order is, (iv) *Hoist away on the jib*. At the same time it is customary to also give another order, (v) *Hook on the crutch-tackle and haul over on the main boom*. As the jib is hoisted up, the sheet being made fast on the proper side, that is, the side which was to leeward, it catches aback and the vessel's bow is swung off from the wind. The next order, as her sails get full, is, (vi) *Draw away the jib*. Under some circumstances the vessel may gather stern-way while this evolution is being performed, in which case it is necessary to give the order, (vii) *Shift the wheel*.

SHOOTING TO.

This evolution is peculiar to fore and aft rigged vessels, perhaps especially to fishing vessels. It is performed for a variety of purposes, such as sounding, speaking a vessel, or at any other time when it is desirable to deaden the headway without hauling down the sails or heaving to. To shoot a schooner to, it is only necessary, when sailing by the wind, to put the wheel part way down, and as she comes head to wind to keep her in that position by the management of the helm until her headway is stopped. One who is skillful in managing a vessel in this manner may be able to sound even in more than 100 fathoms of water with little trouble and loss of time, much less than would be taken if the vessel were hove to.

When speaking another vessel it is customary to pass by her stern and shoot to alongside of her. In this way the captains are enabled to converse, under ordinary circumstances, for a number of minutes. There are other purposes for which this evolution is performed. These will be considered below.

HEAVING TO, OR LYING TO.

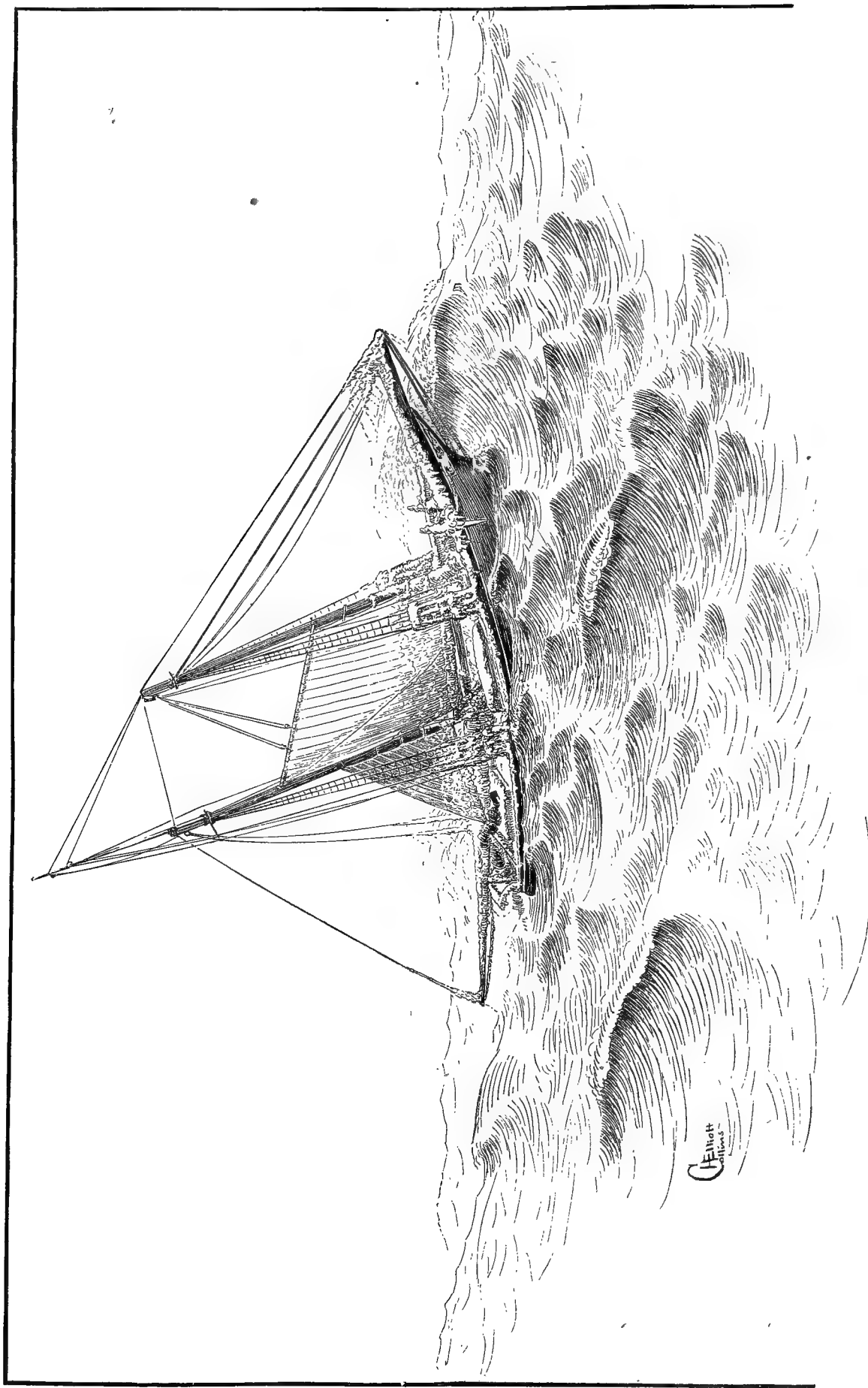
This evolution may be performed in several ways:

(a) *Heaving to with jib to windward*. (b) *Heaving to under two sails*. (c) *Heaving to under foresail*. (d) *Heaving to under mainsail*.

A vessel may be "hove to" under various circumstances, either for a temporary purpose, such as taking a boat on board, or picking up anything which has dropped overboard. Again, on the fishing ground, when sounding, while making observations upon the fish, or waiting for their appearance, or when waiting for the small boats which are setting trawls or otherwise engaged; or, again, in a storm, when it is not safe to be under other sail. Vessels frequently lie to on the fishing grounds at night in order to keep their position, and in the day-time to catch fish.

LYING TO WITH A JIB TO WINDWARD.—This is accomplished by fastening the jib-sheet on the weather side and putting the wheel down, the fore-sheet being sometimes slackened off and at other times trimmed in its proper place. This is a favorite method with the mackerel seiners during the day, when they are watching for the appearance of fish, and also for the vessels engaged in the haddock fishery, while on the fishing grounds. A vessel lying to under this sail can be filled away and managed with little delay and by a few persons.

HEAVING TO UNDER TWO SAILS.—The method of heaving to with mainsail and foresail was the favorite one with mackerel catchers when that fishery was prosecuted with hook and line, and is also practiced to some extent by other vessels. To heave to in this manner it is simply necessary to guy out the main boom, haul down the jibs, and ease off the foresheet, at the same time putting the helm down. The orders are given as follows: (i) *Stand by to heave to*. (ii) *Ease off the main-sheet; hook on the boom-tackle and haul it taut*. (iii) *Haul down the jibs*. (iv) *Ease off the fore-sheet*; and (v) *Let her come to*. In obedience to the last order the wheel is put down so that the vessel comes up to the wind. As the vessel comes to the wind her mainsail catches aback and her



Fishing schooner lying-to in a gale on the Banks, under riding sail and double-reefed foresail.

Drawing by H. W. Elliott and Capt. J. W. Collins.

headway is deadened; she soon stops, and makes a square drift at right angles with the direction in which she heads. A vessel is also very often hove to in this manner when sounding or fishing for cod on the Banks and elsewhere.

HEAVING TO UNDER FORESAIL.—A vessel is “hove to” under a foresail either to hold her position on the fishing grounds in the night, as is the custom with the mackerel catchers, or during a heavy storm or gale, when it is not practicable to have mainsail and jib set. In the latter case, however, the foresail is always reefed, the other sails are taken in and furled, the foresheet trimmed aft, and the wheel put down. Sometimes a riding sail is set on the mainmast to keep the vessel steady and closer to the wind than she would be under reefed foresail alone. The vessel in this way heads within about five points of the wind and goes ahead slowly. The leeway is usually from three to six points—that is, the course is from three to six points to leeward of where she heads, the amount of leeway depending somewhat on the force of the wind and waves.

HEAVING TO UNDER MAINSAIL.—Heaving to under a mainsail is an evolution which is less common than formerly. This method was practiced almost exclusively by the mackerel catchers when engaged in hook-and-line fishing and was usually done to give the vessel a steadier and square drift. It is done in the same manner as heaving to under two sails, with the exception that the foresail is lowered and furled.

BRINGING A VESSEL TO ANCHOR.

ON THE BANKS.—If the vessel is under bank sail (for description of this sail see under “Schooner rig”) it is customary to haul down the jib and to ascertain the depth of water by sounding. If the proper depth is obtained the orders are given, (i) *Let go the anchor*; (ii) *Pay away (or “stick out”) the cable*; while this is being done by part of the crew the next order is (iii) *Furl the jib*. The foresail is usually kept up until the anchor reaches the bottom and occasionally for a few minutes later. The order is then given, (iv) *Lower away (or haul down) the foresail*. The foresail is then furled (being sometimes first reefed). When it is thought that sufficient cable has been paid out to enable the anchor to catch the bottom the order is given, (v) *Weather-bit the cable*.* As soon as the anchor catches the bottom the vessel fetches up and swings head to the wind; the order is then given, (vi) *Strad her up*.†

The method of anchoring on the Banks is much the same in rough weather, the only difference being that sometimes the foresail is taken in sooner. While it is quite a common occurrence to bring a vessel to anchor in moderate weather with mainsail up, this is rarely undertaken with strong winds and a rough sea. When this is done, however, the vessel is hove to under two sails before the anchor is let go, and while the cable is being slacked away, or “paid out,” the foresail is lowered and furled, and the jib is also furled. When it is supposed that there is sufficient cable out for the vessel to fetch up, the order is given, (i) *Stand by to take aft the main sheet*. As the vessel swings head to the wind the boom-tackle is slackened and the sheet is pulled in until the main boom is directly amidships or parallel with the direction of the vessel. The crutch-tackles from each side of the stern are then “hooked on” to steady the boom, which is lowered into a crutch and the tackles are hauled taut. The mainsail is then usually lowered away and furled,

* Weather-bitting the cable is to take an extra turn with it round the end of the windlass and over the windlass-bit, so that it can be held firmly from slipping or “rendering” when the vessel fetches up, and consequently brings a heavy strain on the cable.

† “Stradding the cable up,” is winding round it a number of braided ropes called strads, each from 9 to 12 feet long. These are pointed at the ends, and one after another is put on until several fathoms of the cable have been covered, so that the lower part of that which has been stradded will reach nearly to the water, while the upper part is some distance inside of the hawse-pipe. This is done to prevent the cables from chafing in the hawse-pipe or about the stem.

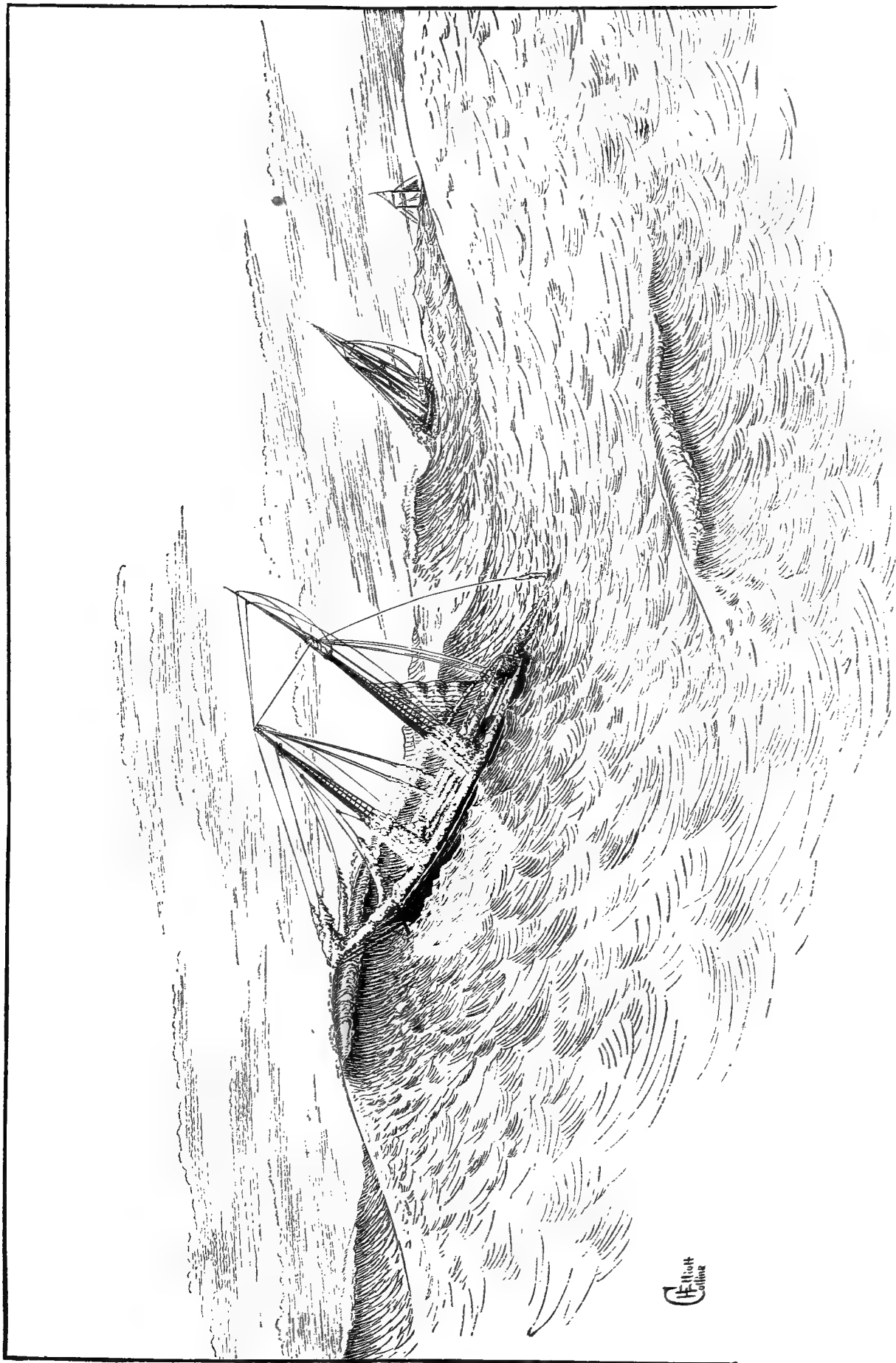
except in special cases, when it may be temporarily kept up. Occasionally, when anchoring in this way, it may be desirable to lower the mainsail before the foresail is taken in.

ANCHORING IN HARBOR IN SHOAL WATER.—To bring a fishing schooner to anchor in a harbor, if there is sufficient room, the jib or jibs are first lowered and the helm put down so that the vessel shoots dead in the wind until her headway ceases. When she has stopped and begins to gather sternway the anchor is let go. There are, however, quite a number of ways of doing this, dependent altogether upon surrounding circumstances. If running into a harbor with a fair wind where there is a large fleet at anchor, there may not be room enough to handle a vessel in the manner just described. The after sails are then first taken in and furled, and last of all the jib is lowered. The anchor is let go "under foot" while the vessel is still forging ahead. Sometimes all the sails but the mainsail are hauled down; at other times all but the foresail. Indeed, the management of the sails varies with the occasion, and therefore no definite rule can be laid down.

BRINGING A VESSEL TO A DRAG.

The act of bringing a fishing vessel to a drag is necessary only in the most furious gales. As a general thing, when this is done, the vessel is lying to under a close-reefed foresail, with, occasionally, also a reefed riding-sail set on the mainmast. On fishing vessels it is customary to attach the drag, whatever it may be, to the riding anchor on the port side, and for this reason, the vessel, if she is lying to on the starboard tack, is worn around so that she will be on the port tack before the drag is put out. Sometimes the seas are so dangerous that it is impracticable to wear around, and in such a case the starboard tack must be used instead. The simplest form of using a drag on a fishing vessel, when drifting in deep water, where there is no probability of the anchor taking bottom, is only to throw out the anchor and pay out from one to two hundred fathoms of cable. The foresail is then taken in and furled, and the reefed riding-sail, or perhaps the peak of the "balance-reefed mainsail," is set, in order to keep the vessel steady in the sea and close to the wind. The necessity of frequently heaving the vessel to a drag in the extremely violent gales which the fishermen encounter has led to the substitution of several devices much more effective than a simple anchor in offering a resistance to the water and keeping the vessel's head near the wind. One method is to sling one or more casks or barrels, and to attach them to the anchor. The casks have holes in them so that they are soon filled with water and they then offer considerable resistance to the drifting craft and assist materially in keeping the vessel in proper position. Planks and spars have been used for the same purpose, being slung at the ends or in the middle. Some special appliances have also been made, constructed of plank, canvas, and iron. The last mentioned are commonly made fast to the anchor and cable, which are paid out in the manner described. It is probable that with a suitably devised apparatus much better results could be obtained by simply attaching it to a hawser, without any anchor.

The practice of carrying drags or floating anchors is, unfortunately, too much neglected on our fishing vessels. The object of this form of apparatus is to prevent foundering of sea-going vessels when lying to in heavy gales, especially when sails have been blown away, or when from other causes a vessel has become unmanageable, or is lying in a dangerous position. Unless a vessel is provided in such an emergency with some sort of a drag to be put out at the bow, so as to prevent her from falling into the trough of the sea, she is liable to meet with serious disaster, amounting in many cases to an entire loss of the ship and crew. It is believed by many whose experience renders them capable of judging correctly that a large percentage of the loss by foundering which occurs to the fishing fleet of New England might be obviated by the use of properly constructed drags. As is well known, heretofore seamen have generally been compelled in such



Fishing schooner at anchor in winter on the Grand Banks, riding out a gale.

Drawing by E. W. Elliott and Capt. J. W. Collins.

Elliott
Collins

emergencies to rely on some sort of floating anchor improvised from spare material on shipboard, such as spars, casks, &c., the rigging of which is generally attended with much danger and delay, at a time, too, when the utmost dispatch is desirable, if not imperative. And when completed these rudely constructed affairs are rarely, if ever, found to answer well the purpose for which they were designed, shipwreck and loss of life often being the result of their faulty construction. Unfortunately, too, there is created a prejudice in the seaman's mind against using such contrivances, and unless provided with apparatus specially designed for this purpose he must take the fearful alternative of chance to insure his safe return to port.

To obviate these difficulties various improved forms of drags or floating anchors have been designed, some of which are acknowledged to be meritorious; but it is a somewhat remarkable fact, in view of the serious losses which have occurred to the fishing fleet, that almost none of the vessels are provided with even the simplest form of sea anchor, which, used in conjunction with a small amount of oil, might often prevent serious disaster.

GETTING UNDER WAY.

The usual method of getting under way in a harbor is: (i) to hoist the mainsail; (ii) to hoist the foresail (sometimes the main gaff-topsail is set at the same time); (iii) to heave up the anchor; (iv) (as the anchor breaks ground) to hoist the jib or jibs, and fill away, although the head-sails are not always hoisted until the anchor is up to the bow; (v) the anchor is catted and taken on the bow; (vi) the staysail or other light sails that may be required are set.

There are several other methods of getting under way in a harbor, dependent wholly on circumstances, such as first heaving up the anchor and filling away under the jib, and afterward hoisting the other sails; getting under way under reefed sails, and also under the mainsail and jib or jibs.

In getting under way on the Banks the anchor is first heaved up and taken on the bow; the foresail is then loosened and hoisted, and after that the jib. The vessel is then under "bank-sail," since she also has a riding-sail up, and, unless she is about to go a considerable distance, no other sail is set, except, perhaps, the flying-jib or staysail. If, however, it is necessary to set the mainsail, the riding-sail is first hauled down and the mainsail hoisted in its stead. If the winds are light and the vessel going a long distance, a main gaff-topsail is also usually set.

BREAKING OUT ANCHOR UNDER SAIL.

This evolution is rarely performed, except under some sudden emergency when it is not practicable to weigh the anchor. Fishermen, while out in their dories hauling trawls, are sometimes caught to leeward in a squall, or the wind may be blowing too hard to allow them to reach their vessel. At such a time, to prevent the loss of the cable and anchor, and to rescue the men, the foresail and jib are hoisted, and an endeavor made to break the anchor clear of the bottom. By this means the vessel may be brought far enough to leeward for the men in the dory to get on board. There are a few instances on record where this has been successfully accomplished, and the lives of several men have thus been saved.

It is a very common occurrence for the halibut vessels, when lying in deep water, to heave short on their cable and then to hoist the sails and break the anchor out in that manner. They then tow it along to another position on the edge of the bank instead of heaving it up to the bow, which would take several hours. At other times they heave in the cable until the anchor is broken out from the bottom, and, setting sail in the same manner, it is towed along, sometimes for a distance of seven or eight miles.

We give the following as an instance of breaking out an anchor under sail in order to rescue

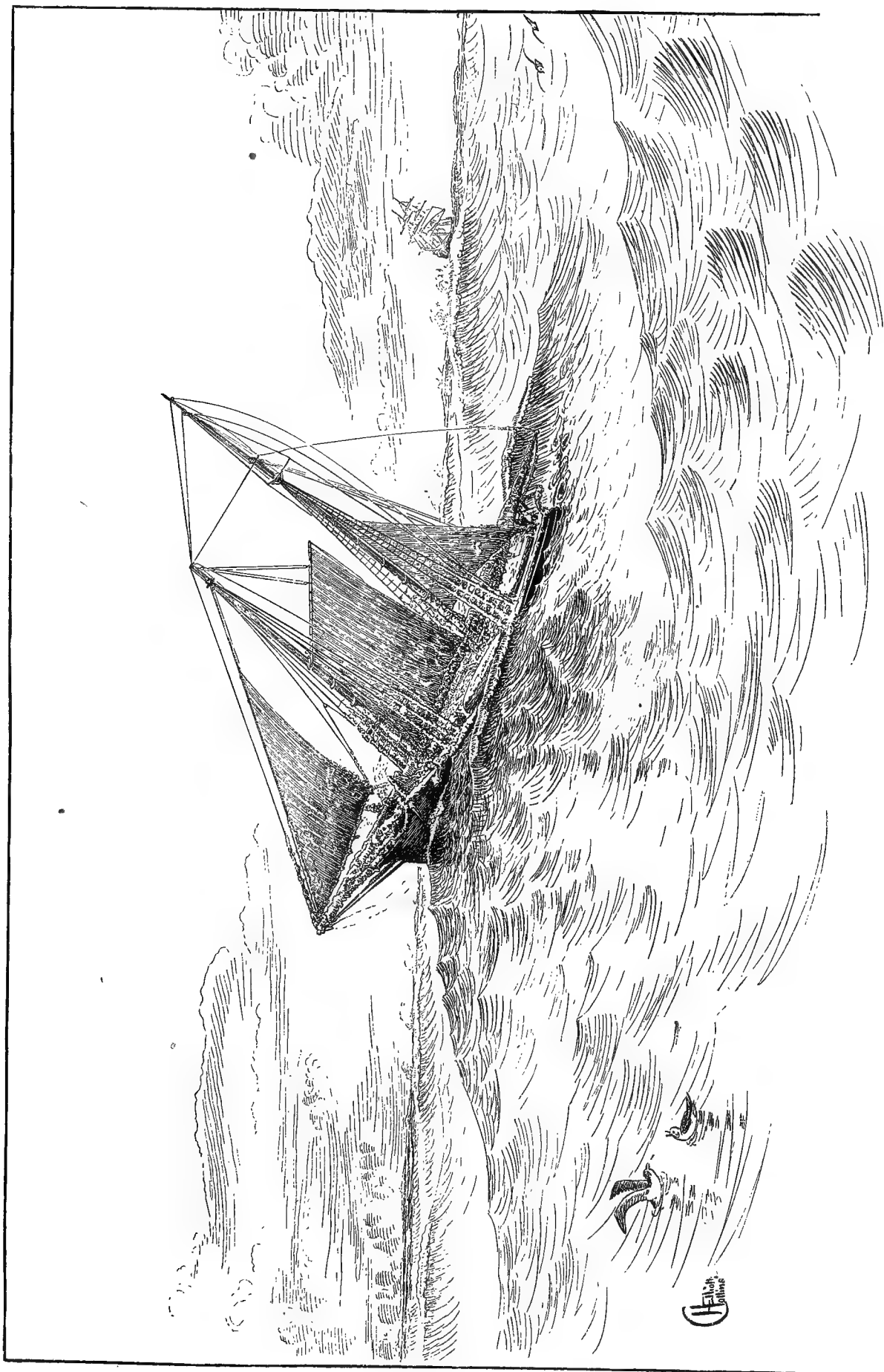
men who were to leeward: In October, 1878, the schooner Marion, of Gloucester, was lying on the southern edge of Banquereau at anchor in 150 fathoms of water. The dories had been out to haul the trawls, and all had succeeded in reaching the vessel except one, which had been detained to leeward, and, at the time of starting for the vessel, was more than a mile distant. The wind had been blowing fresh all the morning and was increasing rapidly. There was but little prospect of the dory reaching the vessel. The ordinary expedient of paying down another dory, attached to a buoy and line, was resorted to and more than a thousand fathoms of buoy-line paid out. The men in the dory succeeded in getting hold of this, but unfortunately the line parted and only one thing could then be done to rescue the men. This was accomplished as follows: The foresail was hoisted and then the jib, which had been guyed out on one side so that the wind would catch it aback and fill the vessel away. The anchor, having firm hold on the bottom, did not at once break out, but it finally let go its hold, after which the vessel ran to leeward and the men and dory were picked up. When vessels are at anchor in shallow water on rocky bottom, the anchor sometimes becomes caught in the bottom, or "rocked," as it is called. It is then necessary that sail be set, and, by tacking back and forth, it may be possible to clear the anchor and thus prevent its loss.

SHOOTING ALONGSIDE OF A SEINE-BOAT.

This is a maneuver peculiar to the mackerel fishermen engaged in purse-seining, and it is one which requires a considerable amount of skill and judgment in its execution. To shoot a vessel to, or to heave her to, alongside of a seine-boat so that she will stop headway almost at a given point, or within a few feet of it, requires an intimate knowledge of the peculiarities of a vessel, and a skillful management of sails and helm, especially since this must be done under different circumstances, which vary with the strength of winds, tides, and sea. The ordinary method is the same as heaving to under two sails, which we have already described; at other times, perhaps, only under the mainsail, the evolution being performed in such a manner that the vessel shoots to close alongside of the seine boat, so that a rope may be thrown to the men in it, the vessel at the same time stopping short at that point. Long practice and an intimate knowledge of the vessels has enabled our fishermen to perform this evolution with a precision and exactness truly surprising.

SHOOTING ALONGSIDE OF A DORY.

In some branches of the fisheries, especially the haddock fishery, the shore cod fishery, and, occasionally, in the halibut and bank cod fishery, the vessels make "flying sets," or, as it is more frequently termed, "set under sail." This particular method of setting trawls will be discussed elsewhere. It is unnecessary to go into details here further than to state that the vessels, instead of being anchored, are kept under sail while the trawls are being set and hauled. While the fishermen are out in the dories setting and hauling, the vessel is managed by the captain and cook, and whenever one of the dories has finished the operation or has secured a load of fish, the vessel is shot to close alongside of it, so that it may come on board at once. This evolution is often performed when there is a strong wind and quite a rough sea, and it requires the same amount of knowledge and skill in handling the vessel as it does to shoot alongside of the seine-boat. In the latter case, though it is not absolutely necessary that the vessel should shoot so close to the dory or stop so short, the feat is more difficult because there are only two men to manage the vessel. As a general thing the vessel is shot to, or hove to, with her jib to windward, and sometimes the fore-sheet is eased off, so that the vessel makes a drift nearly at right angles with the direction in which she heads. At other times, especially in rough weather, when there is



Fishing schooner bound home in winter; head-reaching under short sail; deck, sails, and rigging covered with ice.

Drawing by H. W. Elliott and Capt. J. W. Collins.

a sufficient number of men on board to accomplish it, the vessel is hove to close alongside of the dory under two sails, and in all respects this evolution is then similar to that of shooting to alongside of a seine-boat. There are, perhaps, some other ways of shooting to alongside of a dory, such as shooting up and tacking at the same time, thus reaching the dory and shooting to without the jib to windward, and occasionally, when the winds are light, a vessel may be run alongside of the dory and it may be picked up while she is going before the wind.

SHOOTING ALONGSIDE OF A WHARF.

This is an evolution which is constantly being performed in any of our larger fishing towns, but while it is of such common occurrence and is, almost without exception, performed with an astonishing degree of skill and judgment, there are so many different ways of performing the maneuver, dependent upon surrounding circumstances, that only a few of those in common use can be given here. It is, perhaps, scarcely necessary to say that on returning from a voyage it is the ordinary practice for a fishing vessel to go at once to the wharf where her cargo is to be landed and where she will be refitted for another cruise. This might be accomplished, as with larger vessels, by first anchoring and either being towed in by a tug or hauling in by warps without any great risk or display of skill, but this would involve a loss of time and an amount of extra labor which it is at all times desirable to avoid. One of the most common ways of shooting alongside of a wharf, when the wind is blowing from it, is for the vessel to be kept under sail and under headway until she approaches comparatively close to it and some distance to leeward. The head sails are then hauled down and she is luffed to the wind, after which the mainsail is lowered. It is customary at such times for the skipper, or master, to take a station where he can command the scene. An experienced man is placed at the wheel, who steers the vessel in conformity to the orders of the captain. Other men stand by with ropes to throw out as the vessel approaches the wharf, these being fastened by persons on the wharf in readiness to receive them. The headway of the vessel is thus checked and she drops into her berth. To shoot into a wharf with a free wind all sails are hauled down while the vessel is yet some distance from it and she is allowed to run in with bare poles. This, however, can only be accomplished with safety when there is a comparatively moderate wind, or when perhaps the tide is partially ebbcd, so that the vessel may bring up on the bottom. It is by no means an unusual occurrence for a vessel to shoot alongside of a wharf with her mainsail, and sometimes her foresail, up when the wind is blowing from it.

LEE-BOWING ANOTHER VESSEL.

At the present time this evolution is seldom performed. When mackerel were taken by jigging or with hook and line, one vessel would sometimes attempt to draw away, or "toll," a large school of fish from another. This was done by heaving to, either under two sails or under mainsail, close under the lee bow of the vessel which was catching the fish and by throwing out of a great amount of "toll" bait. The mackerel usually followed this bait, and the consequence was that the leeward vessel soon had the best fishing. This maneuver corresponds, in many respects, to heaving to alongside of a seine-boat, since the vessel must be stopped directly under the lee bow of the other, but of course it differs in that she is not brought as close to the windward vessel as she would be to the seine boat. Some twelve to twenty years ago it was not uncommon on our New England coast, especially in the fall, to see from two hundred to four hundred or even five hundred sail of vessels lying to, in apparently a compact mass, fishing for mackerel. This was the result of one after another lee-bowing such vessels as had secured good fishing.

RUNNING A VESSEL UPON A LEE SHORE.

Most of the fishing vessels are employed at all seasons of the year, and probably more exposed than any other class of vessels to the dangers incident to approaching the land. One of the greatest of these dangers is being caught on a lee shore. Vessels are seldom compelled to resort to the expedient of running on the land in a gale, for they are usually well provided with ground tackle to ride out at anchor almost any gale. This expedient is almost always resorted to when others fail. Occasionally, however, a vessel may be caught on a lee shore in a heavy gale, in which she is unable to carry sufficient sail to work off, and may not be provided with proper tackle for holding on at anchor. When it is quite certain that the vessel will be driven ashore by the force of the gale (it may be during the night), it is considered more prudent, for the safety of the men, to run the vessel "head on" upon the land while it is yet light enough to select the best place "to beach." When such a course is decided upon, it is customary to set all the sail that the vessel can carry, and to keep this on her even after she has struck, if it be a sloping shore, until she has been driven up as high as the winds and waves will force her. If this is done at high tide or on the first of the ebb, it is probable that the crew will be saved. There have been numerous instances in the Bay of Saint Lawrence, especially on the north side of Prince Edward Island, or in the bend of the island, as it is called, of fishing vessels running ashore in this manner. The vessels have sometimes been driven so high that they were but little injured, and after the abatement of the storm were again launched and employed in the fisheries for many years thereafter.

In the fall of 1851, and again on August 23 and 24, 1873, many instances of this kind occurred in that locality, together with many of a sadder nature, which will long be remembered by those interested in the fisheries.

JUMPING A VESSEL OFF A LEE SHORE.

When a vessel strikes on a ledge a heavy press of sail may be set, and by careening the vessel down she may "jump off." This maneuver is often assisted by the sea, as the vessel, with a crowd of sail on her, will move ahead as often as she raises on a wave, and unless the ledge is too near the water's surface for her to pass over, or other circumstances are very unfavorable, the attempt is generally successful.

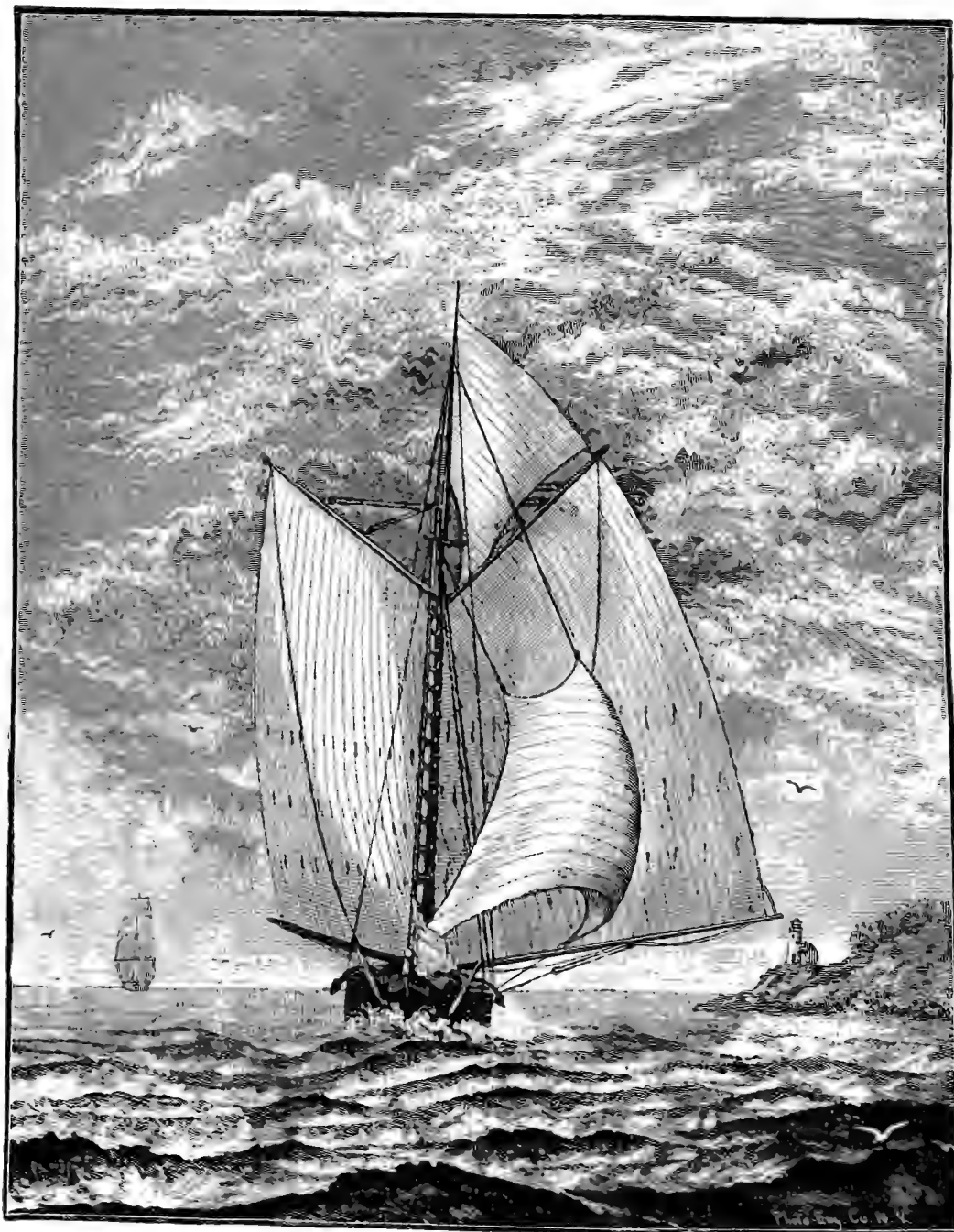
53. AMOUNT OF CANVAS CARRIED BY A SCHOONER.

Although a schooner can carry more sail when the wind blows from a direction abaft the beam, her peculiar excellencies are best seen when the wind is forward of the beam, and when she is said to be "sailing by the wind."

In discussing the amount of canvas carried under different circumstances by the same vessel, we propose to speak of her management (1) when sailing with the wind "on the quarter," (2) when sailing "by the wind," (3) when sailing with a "beam wind," (4) when sailing with the wind "astern."

Wind coming from a direction abaft the beam—that is, stern winds and quarter winds—are called "free winds," while those at right angles to the keel are beam winds, and those blowing from a direction forward of the beam are called "scant" or "head" winds.

The difference between a "scant" and a "head" wind is thus defined: When a vessel can keep on her course while sailing by the wind, it is called a "scant wind," but when she is unable to do this it is called a "head wind," a head wind being any wind which necessitates tacking back and forth—that is, beating to windward.



Fishing schooner running before the wind, wing and wing, with the staysail scandalized.

Drawing by Capt. J. W. Collins.

While this may not be the place to discuss the ability of the schooner to sail close to the wind, it may be stated that the average fishing schooner may be steered within five points of the wind, and the best sailers, under favorable circumstances, within four points. In this respect their performance is equal to that of many yachts. There are probably no modern vessels in the New England fishing fleet which cannot sail within five points of the wind. To sail within four points of the wind it is necessary for a vessel to head northeast when the wind blows directly from the north or at an angle of 45° with the direction of the wind; when sailing within five points of the wind the vessel would be heading northeast by east—the wind being still from due north—or at an angle of $56^{\circ} 30''$. When a vessel is sailing more than five points off from the direction of the wind, she is no longer sailing “by the wind,” and the sheets must be slackened and the sails allowed to go farther out upon the leeward side. As her course deviates farther and farther from the direction of the wind she is said to be running with “free sheets,” until the wind becomes “abeam” or at an angle of 90° to the direction of her keel. When the wind comes from a direction which is more than 90° from that in which the bow is pointed and at an angle as great as or in the vicinity of 135° , she is said to be sailing with the wind “abaft the beam.” When the wind is about 45° abaft the beam, she is sailing with the wind on her quarter, the direction of the wind having the same relation to the stern of the vessel that it had to the bow when the vessel was sailing “by the wind.” When the wind is blowing in such a way that its direction forms with the keel an angle of less than 45° , the wind is said to be “aft,” and if directly astern, the vessel is said to be sailing “dead before it.”

WITH THE WIND ON THE QUARTER.

The average schooner sailing with the wind “on her quarter,” with her fullest complement of sails, will carry all her sails until the wind blows what the fishermen would call a “good breeze.” The first sails to be taken in, as the wind freshens, are the balloon-jib and staysail. This is necessary in order to prevent the topmasts from being carried away. A vessel carrying all her sails with a fresh breeze would probably heel over until her scuppers touched the water, and sometimes deeper, before it would be necessary to take in the balloon-jib and staysail, and, under these circumstances, would sail at the rate of 10 to 12 knots an hour.

Under these conditions the vessel makes its best speed, the water usually being smooth and the “point of sailing” favorable. Large vessels belonging to the port of Gloucester and other fishing ports have, under such circumstances, made a speed of 13 or 14 miles an hour.

As the breeze increases in strength the foretop-sail and then the maintop-sail are removed. The heeling over of the vessel would remain about the same, and her speed would be practically undiminished. The flying-jib is next taken in. The vessel is now moving ahead with what is called a “whole-sail breeze,” and when the jib, foresail, and mainsail are set, is said to be under “whole sail,” the other sails being known as the “light sails.”

The differences in the shape and rig of vessels render it possible for some to carry a certain amount of sail much longer than others, and to heel to an extent which would be dangerous to others. The average schooner must shorten sail when the lee-rail is level with the water.

With a whole-sail breeze and a comparatively smooth sea the speed of the vessel remains about the same as when the breeze is lighter and all sails set. It is supposed that a whole-sail breeze, for a vessel with the wind on her quarter has a velocity not far from 30 miles an hour.

A schooner-rigged vessel will carry a larger proportion of sail in comparison with a square-rigged vessel when sailing by the wind than under any other circumstances. As the wind increases, the mainsail is taken in and reefed. It is usually the custom at such times, especially

if the wind is increasing rapidly, to put either a single or a double reef in the mainsail. The Gloucester fishermen usually put in a double reef at once. At the same time the bonnet is taken out of the jib. When it has become necessary to shorten sail to this extent the sea is always rough and the speed of the vessel may be somewhat diminished, perhaps to 9 or 10 knots.

As an instance of speed made under such circumstances, it may be stated that the schooner William H. Foye, in the spring of 1875, made a passage to the Western Bank, a distance of 380 miles, in about forty-two hours, or an average speed of 9 miles an hour, running almost all the time under reefed mainsail, jib with the bonnet out, and whole foresail.

Before it is necessary to shorten sail further the wind has strengthened to nearly a gale. The pressure upon the foremast is now so great that it soon becomes necessary to reef the foresail, to prevent the foremast being carried away.

If the wind is increasing rapidly two reefs are at once put in the sail; if otherwise, a single reef. A vessel with mainsail and foresail double reefed and the bonnet out of the jib can carry that sail, while running free, until the wind blows a gale.

The following instances illustrate the relative amount of sail carried by schooners and square-rigged vessels when it is necessary to put the former under this sail:

The schooner Ocean Bell, in the spring of 1874, while on a passage to Gloucester from the Grand Bank, sailing under double reefs, fell in with and passed a large bark, head-reaching under close-reefed topsails and foretop-mast staysail. Again, in the autumn of 1875, the schooner Howard, under double-reefed sails, fell in with and passed a large bark lying to under a goose-winged lower maintop-sail, having no other sail set. Numerous and possibly more striking instances of this sort might be related. These schooners were sailing by the wind, and under these circumstances the comparative merit of the schooners appears at best advantage, although they cannot carry the sails so long when sailing by the wind as when the wind is on their quarter. A schooner with the wind as last mentioned may carry this sail until the wind blows a smart gale, and it is more frequently the case that they have to shorten sail still further on account of the roughness of the sea, and the consequent heavy lurching, than because of their inability to carry so much canvas. The wind is now whistling, or, in fishermen's phrase, "squealing" through the rigging: and even an ocean steamer, if heading the sea or in its trough, would be tossing about in a manner which would be very uncomfortable and alarming to most of the passengers.

As the sea and the wind increase there is a danger of carrying away the main boom, the end of which is frequently dipped under as the vessel lurches to leeward. The mainsail is now, therefore, taken in and furled, and in its stead the riding-sail, especially on the Bank vessels, is bent to the mainmast and hoisted, this sail being without a boom and considerably smaller than the two-reefed mainsail, therefore causes the vessel to lurch much less than when she has the long main-boom over her lee quarter.*

Under the present arrangement of the sails, riding-sail, double-reefed foresail, and jib without the bonnet, the vessel continues until the wind blows a heavy gale.

When a schooner is going ahead under these sails an ocean steamer would be making slow progress if heading the wind, and would be obliged to alter her course to avoid lying in the trough of the sea if she should be steering with the wind abeam.

In the heavy gale of January 27, 1879, the schooner Marion, of Gloucester, while running under this sail, passed a large ocean steamer near the Western Bank, making slow progress to the west-

* Sometimes the riding-sail is not set, but the vessel is allowed to run under double-reefed foresail and jib. The method of setting the riding-sail as described is, however, perhaps the most common.

ward, with the wind on her starboard bow, and having only the fore and main spencer set. During this gale several merchant and fishing vessels met with disasters. The sea at this time is so high that it is frequently necessary to run nearly dead before the wind to prevent the vessel being "knocked down" or "tripped," or a sea boarding her on her quarter. The next move is to take in the riding-sail and jib and furl them up. When this becomes necessary the wind is blowing nearly a hurricane. The vessel is now running under a double-reefed foresail, and can continue under this sail as long as the canvas will stand. Instances in which it has been blown away are not unusual. Fishing vessels are not often obliged to come down to a double-reefed foresail in the summer months, though they do so sometimes during the so-called "fall hurricanes." In the winter a voyage of a few weeks is seldom made without running under double-reefed foresail at least once, and, in many instances, ten or twelve times during the trip, particularly if long passages are made.

It is unfortunate that there is no means of estimating the force of the wind as it blows in mid-ocean, but many observers consider that its velocity far exceeds anything that has been recorded on the land, except perhaps at such exposed locations as the top of Mount Washington.

When the anemometer at the signal station on Thatcher's Island records a wind velocity of 65 to 70 miles an hour, it has been reported that fishing vessels in the immediate vicinity have, in some cases, carried double-reefed foresail and mainsail, and jib without the bonnet, and, in other instances, double-reefed foresail, jib with two bonnets removed, and riding-sail. This, too, was when they were sailing by the wind and carrying less sail than they could carry had they been running free. The remarks with reference to sailing with the wind "on the quarter" apply in a general way when the wind is "abaft the beam" or "well aft."

SAILING "BY THE WIND."

When the vessel is sailing by the wind the management of the sails is similar to that already described, except that sail is reduced sooner as the wind increases in force. The sheets being hauled tight, the booms, within a few degrees, parallel to the line of the keel, and the sails showing a flat surface to the wind, a much greater lateral pressure is brought to bear upon the vessel. A vessel running free is, of course, going in the same direction as the wind, and feels its force in a less degree. A vessel sailing by the wind will come down to double-reefed sails, when, with the wind on her quarter, she might, perhaps, carry whole sail. When a vessel running with the wind on her quarter would be under double-reefed sails, one sailing by the wind would need to be "hove to" under double-reefed foresail.

WITH THE WIND "ABEAM."

When the vessel is sailing with the wind abeam sail is reduced in the same manner as already described. When the wind is abeam sail can be carried longer than when sailing by the wind, though not so long as when the wind is on the quarter. This is not so much on account of limitations connected with the management of the sails themselves, but because when a gale is blowing it is necessary to avoid sharp seas directly upon the beam, which are frequently very dangerous and sometimes result in "knocking the vessel down." Occasionally a vessel sailing with the wind on the beam must be "hove to" sooner than when sailing "by the wind," and always sooner than with the wind "on her quarter."

WITH THE WIND ASTERN.

When the wind is astern a comparison between the schooner and the square-rigged vessel is least favorable to the schooner, except perhaps during very light winds. Every possible device

is used to spread the sails to the wind. The most common use of this is "winging them out," which is done by having the mainsail and mizzenal hoisted on one side and the foresail on the other with their sheets slackened till it is that the sails are nearly at right angles with the direction of the vessel, and in such a position as to prevent the greatest amount of pressure from the wind. When winging "winged" the main jib is generally hoisted down, and sometimes also the fore jib or jibs. It is useless at this time to set the foremast in its proper place, and when the winds are moderate it is therefore frequently set in reverse position the foresail, and in such a manner that it comes the windward passes through between the mainsail and mizzenal, adding materially to the speed of the vessel. This method of setting it is called "winging the foremast." The rate of speed attained by vessels with their sails "winged out" is nearly the same as with the wind "in the quarter." Sail may be carried thus for a long time, but it is not customary to do so, because it is difficult to take the sails during strong winds when they are "winged out." A vessel will sail under double-reefed mainsail and mizzenal "winged out" when with the wind on her quarter she would be running under the same sails with the jib up. When canvas and rigging is needed in sailing with a decreasing wind astern. Tackling skippers have carried whole sails in this manner when the wind was blowing a gale. Serious damage has sometimes resulted as a consequence.

4. DAMAGE TO INMATE VESSELS

In the chapter on Diseases the injuries to vessel fishing vessels are found have been fully discussed. Each kind of injury is repaired in its own way. There are, however, certain kinds which are repaired in a peculiar manner, requiring special skill and being in the part of the fisherman. A few of the most prominent of these will be mentioned. Of fishing-boats it is said that vessels which have a "rotten" or "rotten" square. Regarding damage to the rigging or repairing or improving of sails, of repairing or improving rubbers, of repairing leaks. Of fishing vessels which have been stocked by the Department of Marine.

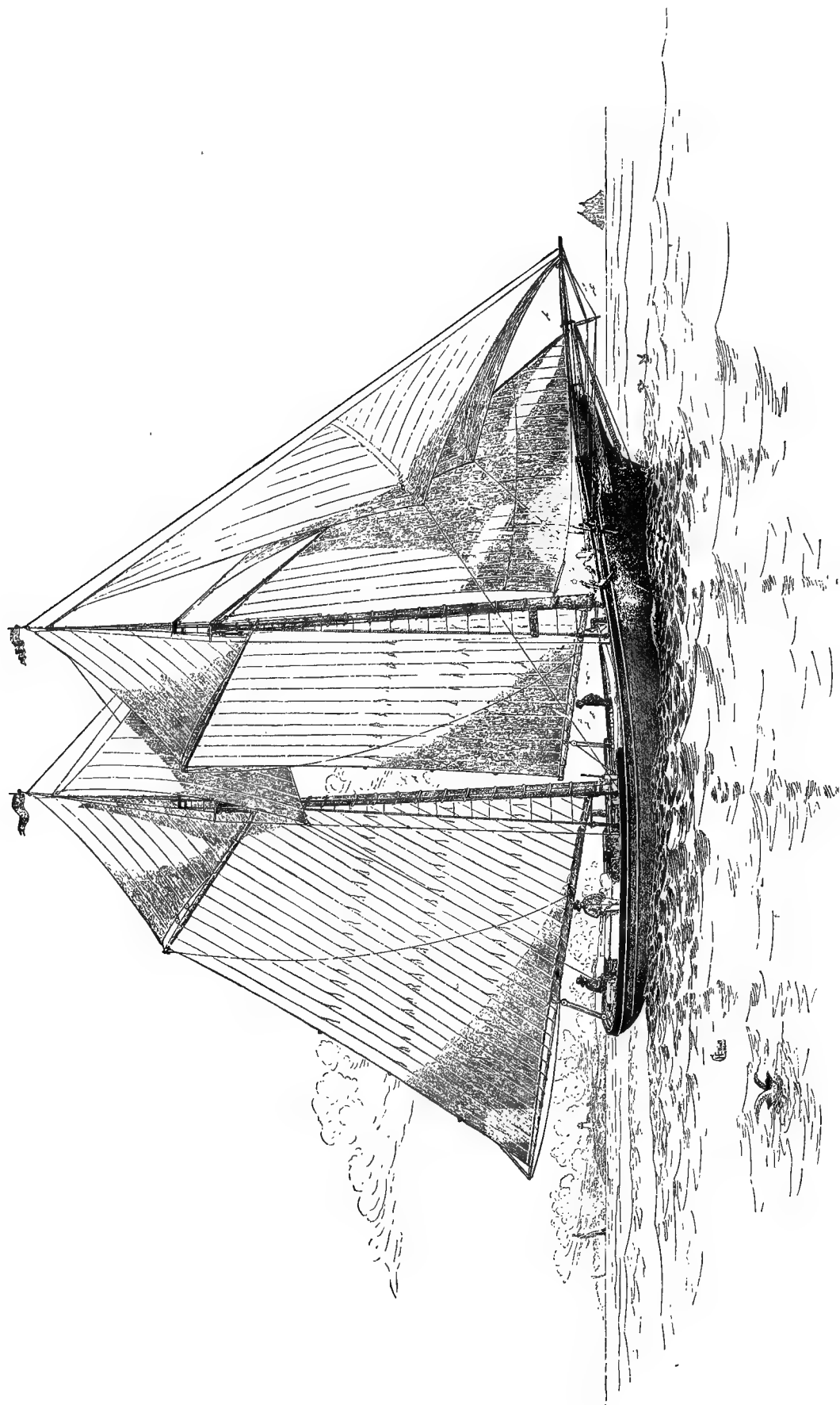
REPAIRING OF VESSELS WHICH HAVE BEEN DAMAGED. — When the rigging is carried away, generally in attempt to make a supply of rigging in sea, although in some cases it is fixed and replaced.

The main boom, if carried away, is generally "fixed" by means of an improved apparatus, which can usually be made in almost every port.

In the case of "sailing" or "boom" apparatus are rarely made to repair it in sea, as it is of the fishing vessels can be repaired.

The fore boom and the fore and main gaff are frequently "fixed" or repaired in such a manner that better than they will ever and new ones can be obtained.

When the foresail is carried away or broken, a purchase is usually taken from the mainmast head and hooked into the eye of the upper end of the jib stay, and hoisted down so that the mainmast may receive support, and at the same time the jib may be set in the stay. By this means the vessel is enabled to sail under her jib and mizzenal, and perhaps with the foremast set between the sails, as well. This arrangement is feasible when the mast is broken but a short distance above the deck. When, however, it is broken near the cross-tree the jib-stay may be joined in the foresail, and a raised foresail and a jib with the foresail can may be set instead of the sail as already described.



Mackerel schooner under full sail, close-hauled by the wind.
Drawing by H. W. Elliott and Capt. J. W. Collins.

When the mainmast is broken or carried away, if broken close to the deck, it is difficult to set any after-sail unless a jury-mast is rigged. This may be done by lashing the main boom or some other spar to the stump of the mainmast and attaching the halyards to its top, in such a manner that either a reefed mainsail or riding-sail may be set on it. When, however, the mainmast is broken higher up, it frequently becomes possible, by shortening the shrouds and putting on a "preventer spring-stay," to set a reefed mainsail, or, more commonly, a riding-sail, which, together with the jib and foresail, generally enables the vessel to make fair headway, even against a head wind. Vessels rigged in this manner have often made passages of 600 to 800 miles in a reasonably short time.

When the bowsprit is carried away or broken, either by a sea or by carrying sail, the jib-stay is usually taken in through the "hawse-pipe" and hove taut on the windlass, in such a manner that the jib with the bonnet out may be set on it, and thus the vessel can make steerage way on the wind by having the mainsail reefed; but when running free, may be able to carry the whole mainsail.

Vessels are sometimes so unfortunate as to lose all their spars. It then becomes necessary that jury-masts should be improvised, in order that the vessel may reach port without assistance. There are many ways of doing this, as well as performing the other operations we have mentioned, which can only be determined by the surrounding circumstances. The most general method is to lash some light spar, boom, or gaff, or perhaps even the jib sheet traveler, to the stump of the mast, having the halyard-blocks attached to the topmost end, whereby the sails may be hoisted; fishing vessels rigged in this manner have often arrived safely in port without assistance.

REPAIRING DAMAGES IN THE RIGGING.—Fishing vessels, in common with all other sea-going vessels, are very liable to have their rigging broken or otherwise damaged while at sea, in such a manner that it is of the utmost importance that it should be repaired promptly, both to insure the safety of the vessel and the prosecution of the voyage. As vessels are now rigged, however, one of the accidents of this kind to which they are most liable is that of having the iron work, by which the rigging is attached, broken rather than the rigging itself. On fishing vessels this more frequently occurs to the iron-work connected with the bobstay and jib-stay than to that of any other, since upon this is brought to bear a very heavy strain. These accidents are more likely to occur during gales when there is a heavy sea running than at any other time, and generally call for a display of skill and seamanship such as is rarely needed elsewhere. Usually, when the iron-work on the stem to which the jib-stay sets up is carried away, the end of the stay is taken in through one of the hawse-pipes and set up by tackles to the windlass and secured in a proper manner. It is quite often the case that the iron work at the end of the bowsprit to which the bobstay is attached is broken, and it sometimes becomes necessary to replace this and to set the bobstay up anew, even under the most difficult and dangerous circumstances. Fishing schooners are occasionally liable to have their spring-stays unhooked, or the bolts in the shackles get loose, in such a manner that the mainmast is left without that support. If this occurs when the vessel is under sail, it can be usually replaced without a great deal of trouble by running the vessel before the wind, so that the mainsail may assist to keep the mainmast straight.

If lying at anchor, however, or under some other circumstances, it is generally necessary to get a strap on the mainmast, to which a purchase from the foremast is hooked and the head of the mainmast hauled forward far enough to enable the men to attach the spring-stay in its proper position. The performance of this duty is usually one requiring a great amount of skill and judgment to successfully accomplish it.

The parting of shrouds, laniards, &c., are accidents to which all vessels are liable, and the

same methods of repairing these are adopted on fishing vessels as on other vessels. These methods are fully explained in all manuals of seamanship."

Vessels engaged in the Bank fishery always have their bobstays and the lower part of their jib-stays provided with chafing-gear, to prevent the cable from coming in contact with them. It sometimes happens that while the vessels are riding at anchor in gales of wind this chafing-gear gets loose, and there is imminent danger of the cable being chafed off and lost on that account. To repair this damage and to prevent the loss of the cable there is generally required a great amount of daring and skill on the part of the fishermen, and many schemes are resorted to for the accomplishment of this end, none being, however, free from danger.

The parting and consequent replacing of running rigging is something that is of such frequent occurrence and so common to all vessels that it hardly need be described at length in this place.

REPAIRING OR IMPROVISING SAILS.—The ordinary repairs to the sails made necessary by their being torn, &c., do not differ materially from those on other vessels. We may mention here that in one instance, at least, a great deal of ingenuity was exhibited by fishermen in improvising sails from their bed-clothing, and their vessel, the schooner *Onward*, of Gloucester, came safely into port. It may also be said that the riding-sail, which we have before described, is frequently substituted for a jib when the latter sail has been damaged or blown away, and is also made to do duty for either the mainsail or foresail, which may have been rendered unfit for use. The staysail may be used to take the place of either the mainsail or foresail in light weather, and occasionally the gaff topsail is substituted for a jib, or even for a flying-jib.

REPAIRING OR IMPROVISING A RUDDER.—Since fishing vessels are liable to lose their rudders at sea, it is highly important that some means should be devised for steering, in order that the vessel may reach port without assistance. Various contrivances have been resorted to, among which we will name the following:

(a) By taking an anchor-stock and lashing to one side of it successive tiers of the hawser or cable. Then the bight of a rope is attached to its lower end, and another farther up, at the upper part of the hawser. It is then put overboard and the upper end of the anchor-stock is brought into the rudder-port. The ends of the ropes attached to it are then taken forward and hauled taut on either side in such a manner that the improvised rudder is held in its proper place. The tiller is next lashed to the upper end of the stock, and this serves the purpose very well, and a vessel can usually be steered with it without much difficulty. Sometimes plank or timber may be substituted for the hawser. In cases where an anchor-stock is not to be had a light spar, gaff, topmast, or even the jib-sheet traveler are taken instead.

(b) Another method is to make a coil of hawser, which is securely lashed together in all its parts. This is towed astern, and the movements of the vessel are controlled by tackles leading from either side of the stern to the standing parts of the hawser, the direction of the vessel being changed by hauling in either one or the other of these.

(c) A cask filled with water is sometimes substituted for a coil of cable, and may be made to answer nearly the same purpose.

REPAIRS FROM LEAKS.—The method of repairing leaks caused by collision is the only one that will be considered here. It sometimes happens that fishing vessels are cut down by another nearly to the water's edge, and, unless repaired promptly, are liable to sink before reaching a place of safety. In such cases a man is generally lowered over the side and fastens over the aperture some canvas, over which boards are fastened, if they are obtainable. If this is well done the vessel can be tightened so that she may reach port without accident.

RIGHTING VESSELS WHICH HAVE BEEN KNOCKED DOWN.—Although most of our fishing vessels

have their ballast secured in such a manner that it is not liable to give way, this can not be said of the Bankers engaged in "salt fishing," which depend entirely upon their salt for their ballast. This salt is stowed in "pens," or "bins," built in the hold, and if they are not well built they are very liable to give way when the vessel takes a heavy lurch. This sometimes occurs in a gale, and when it does the vessel is generally "knocked down" in consequence, and thus placed in a very dangerous position. At such a time, when the vessel is lying nearly on her beam-ends, the hold cannot be reached by the usual manner of going through the hatches, and the only thing to be done is to enter the hold through the bulkheads from either the forecastle or cabin. She is then "righted up" by shoveling the salt to windward. This plan is not always successful, since losses have occurred from this cause. Before it was customary to secure the ballast as it is now, it occasionally happened that a vessel was "knocked down," shifting her ballast into the lee side, as the Bankers shift their salt, rendering it necessary for the same efforts to be made in order to bring her again upright.

REPAIRS OF BOATS.—Vessels engaged in the Bank fishery, especially in the winter, are more liable than others to have their dories injured. It frequently becomes necessary that the fishermen should be able to repair them. Many of the men become adepts in this kind of work, and there are quite a number of instances recorded where, by exhibiting their skill and ingenuity in repairing boats almost entirely destroyed, they have succeeded in making a good voyage, which otherwise would have resulted in considerable loss to all concerned.

This applies more particularly to our cod and halibut fishermen, since the whalers are generally provided with professional boat-builders and carpenters, especially hired for the purpose of repairing boats that are damaged, and for constructing new ones.

F.—APPENDIX: CAPE COD FISHERMEN IN 1862; AUTOBIOGRAPHY OF CAPT. N. E. ATWOOD.

55. FREEMAN'S DESCRIPTION OF CAPE COD FISHERMEN.

The following excellent sketch of the fishermen of Cape Cod is from Freeman's History of Cape Cod, published in 1862. It will apply as well to the men of the present day.

"Cape Cod has, not inappropriately, been called the 'Right Arm of Massachusetts.' Without reference to the topographical outline, the designation is merited, if regard be had to the employments, the nautical skill, the enterprising and hitherto morally upright character of its inhabitants; and it is doubtless to these considerations that reference was primarily intended in the figure employed. The glory of the Cape, we unhesitatingly assert, without the possibility of contradiction, has been the character of the men who settled here and, through successive generations, their numerous descendants. We make this declaration ingenuously, unawed by the fear of an accusation of self-laudation or egotism; for we speak of the community as a whole, not ignoring the few anomalies that might possibly be found, as among all people, to constitute the exceptions that prove the general rule; nor claiming for history the unfinished career of generations now on the stage of action.

"The almost entire population of the Cape has been made up of those who were descendants from the Puritans, perpetuating their names and their virtues; and the races here are generally more purely English than in any other part of our land. The Cape has, at all times, furnished its full proportion of enterprise, talent, genius, learning; and the merit of her sons has been acknowledged in all lands. The moral sense and general intelligence of the people, from the time of the earliest settlements, compare favorably with the inhabitants of any age, clime, or country.

"A large proportion of the male inhabitants of the Cape are, as is well known, early addicted to the seas. This is a necessary incident of their locality. As seamen their aim, generally, is to command; and perhaps no one portion of the globe, of similar extent, has furnished so many able commanders of ships. A vague impression, we are aware, has long possessed a portion of the public mind, that a seafaring life is not promotive of virtue; but, that the seamen of Cape Cod are as remarkably exempt from the vices and frailties of humanity as any class of people whatever, challenges denial; and the apprehension to which we have adverted has, whether just or merely imaginary, no support from what is observable here. Our seamen are generally, as before intimated, very soon commanders of ships, rather than ordinary sailors; and such as have not arrived at the distinction are, for the most part, employed in vessels under those commanders or engaged in the fisheries. Their visits to all lands and their intercourse with the wide world give them large views that tend to the formation of a liberal, manly, noble character. Even in their fishing excursions they are, as it were, at home among their relatives and their early associates; and when returned to the land and under their own roofs—whatever privations they may have suffered in the times of peril, or because of national calamities, involving embargoes and wars—their dwellings are pre-eminently abodes of comfort, and exhibit the marks of healthy thrift and enjoyment beyond

the allotment to other sections of our country, so far as relates to the general and equable distribution of the bounties of a good Providence.

“The fishing voyages, it is admitted, are not always conducted without auxiliaries from abroad. For many years there has been a disposition on the part of persons from the interior to place themselves on board these vessels, to participate in the toils and advantages of these excursions. But, after all, the home hands are the majority. Moreover, those from abroad who seek a place on board our fishing vessels are in many instances agriculturists, mechanics, sometimes tradesmen, and clergymen, whose health has required that they try the salubrious air and salutary exercise of the voyage for the restoration of wholesome and vigorous action of the system—an experiment that seldom fails.

“The sweeping remark of Talleyrand, that ‘all the qualities, all the virtues, which are attached to agriculture, are wanting in the man who lives by fishing,’ has been readily seized by many minds of superficial observation, as if ‘A gem oraculous on Aaron’s breast, or tongue of seers of old infallible’; but let it be borne in mind that those engaged in fisheries from the Cape are many of them agriculturists. This community is very far from being made up of mere fishermen. Unlike the ancient Tyrus, when in fulfillment of its ruin foretold it became ‘the destroyed in the midst of the sea, like the top of a rock, a place for the fishers to dry their nets on,’ the Cape embraces an extent of territory without an overcrowded population, sufficiently productive yet, if not to save from famine the two old colonies of Plymouth and Massachusetts, to remunerate the homely toils of a few practical husbandmen. Indeed, very few persons in the county are exclusively fishermen; nor are the circumstances under which the fisheries are prosecuted such as to stigmatize any class. Admit that under certain circumstances the exclusive vocation of fishing is not most favorable to mental development, the remark would not be applicable at all to the larger class engaged upon the seas and in other employments, nor to the many occupied in various pursuits. Besides, the constant emigration induced by that characteristic enterprise which leads so many to seek wider fields of action, and which has been populating every part of our country ever since the first settlement of the Cape, leaves ample room, so that none are debarred for want of space of the opportunity of associating with other chosen pursuits that of agriculture, horticulture, or kindred avocations. We readily concede, however, that there is nothing necessarily ennobling in mere fishing; indeed, we are constrained to acknowledge that there is always discernable a marked difference just in proportion to the degree in which certain fisheries engross the time of individuals to the exclusion of a larger acquaintance with the world and the neglect of books. Yet, this difference is not more apparent than in the influence of continual application to other callings everywhere. Lumbering, rafting, boating on canals, &c., are attended with similar results. When the Cape shall have become a community of fishermen alone, we shall have better opportunity of testing the axiom of Talleyrand. The Cape Cod man loves his native home. Wherever he may be, whether in foreign climes, or buffeting the winds and plowing the waves of the billowy deep; whether a merchant prince in some one of our large cities, or located on the fertile lands of some new territory; whether north, or south, or east, or near the declining sun, his thoughts ever turn to his place of nativity with fond delight and peculiar yearning; and he is proud to hail from this garden-spot of creation—for such, to him, in an important sense, it appears, whatever impressions others may have conceived of its sterility and stereotyped dullness.

“Of this parvenu aristocracy of some parts of our country at the present day, the Cape makes no boast. It is plebeian, though it has wealth, and that wealth liberally distributed. What is elsewhere often mere show and empty ostentation, is here, generally, substantial reality. A man’s brains are not regarded as lodged in his purse; nor his character and claims as depending on the super-

cilious devotion of sinister and false-hearted hangers-on, nor yet his principles a thing to be determined by the fortuitous chances and mutations of events. Refinement exists, without its sickening affectations and diseased sensibilities; and intelligence, without attempt at the display of the transcendental, unreal, or impracticable. Common sense—we use the term in its good old import—has not so far become obsolete that it is no longer destined to dwell among the denizens of the Cape, a fixed trait. Do we utter extravagances? Does our delineation of the character of the mass of the people seem to partake of a vain boast? Let the verdict of the whole world in regard to the sons and daughters of Cape Cod be the decision of the issue.

“The diffusion of education among all classes is proverbial. One native-born who cannot read and write as soon as seven years of age, would here be regarded as a phenomenon. And here we are forcibly reminded of that peculiar trait in the early settlers of the colony forever worthy of commemoration—their appreciation of the general blessing of early education, and their untiring efforts to secure it for posterity. The education of all was regarded by them as of primary importance to the well-being of the rising generations, the best good of the state, and the greatest happiness of the human race; and to the furtherance of this end their best energies were directed. It was truly fortunate for New England that so large a proportion of its first settlers were people of intelligence and education; and it may well be a subject of devout gratitude to God at the present day, as it is of admiration, that in circumstances so unpropitious to the support of schools, the settlers just beginning to plant themselves in a wilderness in the midst of many privations; obliged to fell the forests and erect for their protection against the rigors of the climate such habitations as they might; compelled to cultivate the lands for their daily subsistence, and oft to defend themselves against apprehended dangers from the aboriginal race—should, with so slender means, have given so much thought to the subject of education, and especially that their thoughts should have been so directed to the education of the masses. It was not enough that they made it a religious duty to instruct their offspring in the family, to enable them to read the Bible; they must have other and greater facilities—an educated ministry, educated officers of state, and teachers thoroughly educated; and we hazard nothing in saying sacrifices were endured and pains taken to accomplish the noble end which are a monument of distinction to the praise of our forefathers, enduring as eternity.

“Never has there been a time in the history of this or any other country when ministers of the gospel were generally—perhaps without exception—better qualified by education and sound learning to give impulse to such a movement, and never were a set of men more influential than the early settlers; nor was it the ministry alone. However much deference was paid to that class of men, the laity, which embraced very many highly educated and a full proportion besides of those who had a large share of (that to which we have already adverted, too generally at the present day most uncommon kind of sense, called by a singular misnomer) common sense, had minds of large views and well disciplined, nor did they fail to employ their efforts—happily in concert with their religious teachers—in effecting what they conceived to lie at the foundation of good morals, good government, and the public weal.

“Private schools were, indeed, necessarily the first resort; but the subject of public schools was agitated from the very first. In 1663 the colony court ‘proposed to the several townships within its jurisdiction, as a thing which ought to be taken into serious consideration, that some course be taken in every town that there be a schoolmaster set up to train children to reading and writing’; and in 1670 that which may be regarded as the very germ of our present truly noble and beneficent system of free schools was enacted: A law freely granting ‘all such profits as may or shall accrue annually to the colony from fishing with nets or seines at Cape Cod for

mackerel, bass, or herring, to be improved for and towards a free school in some town in this jurisdiction, for the training up of youth in literature for the good and benefit of posterity.' That school was established at Plymouth, the seat of government, and was supported six years by the Cape Cod fisheries; when, in 1687, it 'was ordered,' by the general court, 'that in whatever township in this government, consisting of fifty families or upwards, a meet person may be obtained to teach a grammar school; and that such township shall allow at least £12 to be raised by a rate on all the inhabitants of said town; and that those who have the more immediate benefit thereof, with what others shall voluntarily give, shall make up the residue necessary to maintain the same; and that the profits arising from the Cape fisheries, heretofore ordered to maintain a grammar school in the colony, shall be distributed to such towns as have such grammar schools, not exceeding £5 per annum to any one town, unless the court treasurer or others appointed to manage that affair shall see good cause to add thereunto; and further, that every such town as consists of seventy families and upwards, and has not a grammar school therein, shall allow and pay to the next town that has a grammar school the sum of £5, to be levied on the inhabitants by rate, and gathered by constables of such towns by warrant from any magistrate of this jurisdiction.' This law was in force until the union with the Massachusetts colony, or until about that time. The fisheries were then made free to all persons, and other provisions for schools were made.

"The attention of the community has ever thus been carefully directed to the cause of education. The poor and the rich have enjoyed the means of good education. Hence there are few in New England (and, as we have suggested, it would be difficult to find at the present day any adult born on the Cape) who cannot at least read and write, with, in addition, a competent knowledge of figures; whilst generally the opportunity has been afforded to secure that full amount of education requisite to qualify for successful business. In later years, the Cape has kept pace with the educational improvements of the age, and may point to many of its distinguished sons and accomplished daughters as proof that it has never been greatly derelict in this duty.

"The inhabitants of the Cape are a religious people. The entire freedom of religious opinion claimed by them has led to a diversity of denomination, in almost every village as well as town, places of public worship being reared by differing sects. But it is here disreputable to have no religious belief, and there are scarcely any to be found who do not give their support to some one mode of religious worship and form of faith.

"We may add that health, that greatest of all mere earthly blessings, here waves her wand and crowns the votaries of frugality, industry, temperance, and virtue.*

56. AUTOBIOGRAPHY OF CAPT. NATHANIEL E. ATWOOD, OF PROVINCETOWN, MASS.

The following sketch of the life of the veteran fisherman of Cape Cod is given in his own words as told to members of the United States Fish Commission in the summer of 1879. It reviews the life of a man who began fishing in 1816, at the age of nine years, and continued in active service in many branches of the fisheries until 1866, when he became a fish-curer on shore. He said:

My memory is pretty good, and I know in what way I have spent my life. I remember all about my early voyages. I have looked over my notes, going back for several years, so that I know their dates precisely. I know every vessel I have been in and all their voyages from the beginning until the time I quit in 1866, thirteen years ago.

I was born in Provincetown on the 13th of September, 1807. The first that I had anything

* Freeman's Hist. of Cape Cod, Boston, 1862, Vol. I, pp. 741-749.

to do with the fisheries was when I was nine years old. My father quit going to sea, and the next season he was going to take me in the boat with him. That fall he, with some others, got a catch of 250 barrels of sea-herring, and he called me out. He got me in the night to go with him in a boat. I remember it very well, although it was a great while ago, because the boat was nearly full of herring, and I undertook to row, and made a poor piece of work of it. I remember the herring quiddling around my legs. That is the first I had to do with fishing.

The next spring I went, with one other boy, with my father in a boat cod-fishing. We went to Race Point, and used, as the sailors say, to carry our "grub" out with us. Before Saturday night we had to come in and get a recruit. We used a lap-strake boat a little smaller than a whale-boat. The whale-boat rows with five oars, and these had four oars, and we used to call them five-handed boats. There were six-strake boats and seven-strake boats. They were 18 feet keel, and I should think about 5 feet beam, with four thwarts. We sometimes used a small sail, which we made of 9 yards of top-gallant duck, $\frac{3}{4}$ wide. The mast was about 12 feet long.

We landed at the Race and hauled the boats up. We had little fish-huts there. My father built his hut there, which was 6 feet by 8. He was 6 feet tall, and had a berth across the end, and could touch his head at one end and his feet at the other. The hut had a wooden chimney. We took such provisions as we could. Some fared better than others. We were pretty poor. I came from poverty and obscurity. I suppose we were there about two months fishing for codfish. During the season a man and a boy, a youngster like, would probably average about 25 quintals to a boat. That is a fair average for the two months that we stopped there.

After this we came off here and set mackerel nets in the harbor, beginning about the 20th of May to catch mackerel for sale fresh. These were sent to Boston market. After the mackerel season was over there was little doing here in the summer, through July and August, but about the middle of September the dogfish struck in on their way south. The dogfish were here in the spring, as they passed by the Cape going north, but we didn't get many of them. We followed fishing for dogfish two months, from about the middle of September till the middle of November. That was the best fishing of the season, as dogfish oil was worth about \$10 a barrel. A man and a boy would get some 15 barrels in that time. They were mostly females when they came in, but the last school in November were about all males. The males generally had better livers than the females.

When winter came they dropped me, as I was too small to go winter fishing. Two men went together in a boat cod-fishing. We didn't have any haddock at that time. In 25 quintals of fish we didn't get more than 1 quintal of scale fish (haddock, hake, and pollock). The codfish were sold by the hundred pounds, from 50 cents to \$1 per hundred, while the haddock were always counted. One boat would have two haddock and another three, and perhaps two or three boats would have none. Haddock, weighing four, five, or six pounds, would sell for 15 or 20 cents. For many years haddock were altogether higher than codfish, owing to their scarcity. This was in 1817. The business on the whole during the winter helped them out considerably, because there was nothing else to do here. They used clams in the winter altogether for bait. Most of them we dug in the vicinity, at House Point. About the first of March the winter school of fish was over, February being the best month. Then very little was done in cod-fishing until herring made their appearance, which came in generally about the first of April, and when they caught this fresh bait, for two or three days they would do pretty well. We used to catch some few with clams in March.

Now I have told you about what we did the first year, and that is the character of the fishing that we followed right straight along, although some who were able to build pollock seines were

engaged in fishing pollock. They caught them out at the Race in the month of May, but we had no such thing as a seine. We fished every year just about the same from one year to another.

In 1818 I was eleven years old. In November of that year we moved to Long Point and fished from the shore there. Nobody lived there then. I went to school a little while when I was over here, but not much. I was in the fishing boat most of the time excepting a short period in the winter.

In 1819 we carried on the fishery as in the two preceding years. Up to this time I had staid ashore, although I now felt anxious to go to sea, but my father thought I could do better to go with him in the boat and help him. I said I wanted to go to sea, but he would not go to ship me, but said I could go if I wanted to. There was then a vessel fitting out for Labrador, the *Dexter*, Joseph Sawtell, master, and he wanted a cook. Father said I might go over and ship with him. I asked \$40 for the run—that is, for the voyage. I finally traded with him for \$37.50 to go to the coast of Labrador as cook.

We sailed from Provincetown on the 6th of June. All but two of the crew belonged there. There is one man of them still living. The rest are dead. We went to the coast of Labrador, but, as it happened, we were unfortunate in getting codfish. Our men were not the best of fishermen, so that we got a very small share. We carried, I think, 160 hogsheads of salt, and we brought back about 30 hogsheads, and were so much short on the fare. I don't know now how far we went north. We went to what was familiarly known to us as Grosswater Bay. It is not down on the chart. On my return home I found that I had made more than any man on the voyage. Our mode of fishing then was to let the vessel lie in the harbor and send the boats out. We at that time had no vessel on the Grand Bank, and but two or three small vessels went to the Gulf of Saint Lawrence fishing for mackerel. All our fisheries were at Labrador at that time. We carried four boats. We used one boat to get capelin for bait. When fish were plenty during the capelin school the bait boat would seldom go fishing. The fishing boats were baited out of her. We had one of the crew to throat, one to head, one to split, and a salter in the hold of the vessel, salting the fish as they came down. On our arrival on the coast of Labrador few codfish were to be caught until the capelin schools came in, and then the cod came in with the capelin schools. The capelin school lasted about three weeks. If you had some salt when the capelin school was over you might get some herring for bait and fish with them. But we picked up fish very slowly after the capelin went away. When the capelin came on the coast the first that arrived were males. You can tell the male from the female by external signs, so as to distinguish the sexes perfectly well. When the males had been on the coast about a week, then came a mixture of females. They look very much like a smelt, and are soft and full of spawn. We did not use them for food. On an average about one-tenth of the capelin were females. When they had deposited their spawn the males deposited their milt and made the whole water white. Then the females went off. Soon after the fishing slackened off, and we used to say they were capelin sick.

On my return from that voyage, having been absent sixteen weeks and two days, I went to Long Point and was very glad to see another house being erected close by my father's, so that we had two families there in the following winter. In the winter I went in the fishing boat, as I was then old enough to stand the winter. The voyage of the *Dexter* was in the summer of 1820. After fishing through the autumn and winter and in the shore fisheries the next spring, I shipped for another Labrador voyage. My father shipped me on the schooner *Favorite*, Captain Paine. We had ten shares in all, and I had three-fifths of a share. I thought as I was thirteen years old I would not like to go again as cook, and I shipped as a hand before the mast. One of the principal men had a brother about my age, and he was not willing that his brother should cook more

than half the time and wanted to make me cook half the time. I objected, but what was the use? I finally had to submit to it. We went early that spring, about the 10th of May, to the coast of Newfoundland. We fished with clams on the north side, being ahead of the capelin school, in the Straits of Belle Isle and at Bonne Bay. When it came time to go north to meet the capelin school we left the Newfoundland fishing and went to Grosswater again, and fished in Indian Harbor on the south side of Grosswater Bay. We then fished until we consumed our salt, with the exception of a few hogsheads. We got a good fare of fish, about 1,200 quintals. Then we came down into the Straits of Belle Isle and went to a place called Pinwire, and there we washed our fish out and took them ashore on the rocks to dry. We brought them home green the year before. We had to turn and dry them on both sides, because we couldn't dry them underneath. I think we staid there about four weeks. We then took our fish in and started for home. On our arrival home the fish were not dry enough for market, and we went to Gloucester and took our fish out and dried them over again, and then went to Boston for a market. My share amounted to \$83.00. I then came home in October and engaged in the shore fishery and winter fishery, as in years before.

In 1820 we fitted out the first whaling vessels from Provincetown. There were five that went to the Azores and about that region for sperm whales. In 1821 we had twelve vessels from Provincetown in the sperm-whale fishery. My father went as ship-keeper on one of the whalers, and he made a pretty good voyage, so that he felt richer than ever before. In 1822 we fitted out eighteen vessels, and I shipped in the brig Laurel, Cook, master. In the two years previous the whalers, on an average, did considerably better than the cod fishermen, and that was the reason why the whalers increased so fast. We sailed on the 3d day of April from this port, and went southwest out across the Gulf Stream. On the morning of the sixth day from home one man cried out, "Towno!" They now say, "There she blows," when they see a whale. I was below asleep, and the noise on deck woke me. We lowered a boat and went out. There were three or four or half a dozen whales together, but finally they tricked us and got away and we went back to get our breakfast. We saw in the evening a bunch of whales to the leeward, and we got out and struck a small one and held on to her a short time, but she became loose. I saw, however, that she was spouting blood and they didn't throw the harpoon again, but went to work lancing the whales, and we soon had seven spouting blood, and gave them their death wounds very soon. It soon began to look squally, with heavy clouds in the west. The first whale died and the rest moved slowly to the windward, but it blew so heavy that we went back and took the first one aboard and cut her in. It made but twelve barrels of oil. This was south of the Gulf Stream. I could not say just what latitude and longitude it was in, but I think we may have been one-third the way to the Azores. We then run down, without seeing anything more, hunting around until we made the isle of Corvo; and on the following day we went over to the western side of the island of Terceira. We cruised up and down the shore day in and day out. We saw whales once, but they were going very fast. We chased them until night, but lost them. That was the second time we saw sperm whales. Afterwards, in cruising off to the east side of Terceira, the wind came on to blow heavy from the northwest, and we went through the south side and anchored between Port au Pré and Port Angra. I think there were a dozen out of the eighteen of our fleet anchored there. There was a Portuguese boat came down from Angra just to get a list of the crews and a bill of health. All had a bill of health. He boarded the schooner Nero, Captain Miller, of Provincetown, and when he came to call the crew up to examine them one man was below sick in his berth. He says, "I will take you up to Angra;" but the captain didn't like that. Finally he hesitated some and said, "I think I better go up first and get orders." He went off, I

think, two or three miles, and when he got half way up there Captain Miller up with the sails and went off. The boat didn't come back.

The next day the wind moderated, and we all went out, but didn't get to the whaling ground until just at night. The next morning there was the Nero, with a great big whale alongside, and they were cutting her in. We soon struck one. The whale made good play (as the whalers say), and we soon killed her and took her alongside. She made 28 barrels. That is what I call a small take. We then cruised there some time longer, and our next move was to go north, passing the island of Corvo and Flores, about latitude 42. There we cruised six weeks. When we had been out a week or ten days it was very windy one morning, from the southwest, and we discovered a whale coming up close to us. The captain said, "The wind is blowing so that we will not lower down, but run her down." We reefed the sails and soon the whale went down. We looked around another hour, but didn't see her at all. At the end of that time we discovered a whale as much as five or six miles to the north of us, and we stretched on towards it, the wind increasing all the time. Before we got to him he went down. He spouted some forty times in forty minutes, and then went down and staid as long as that. When we got to about where we thought he went down we luffed to. Pretty soon he came up. We lowered the boats and got quite near him, but he moved off faster than we could. That was all we ever got near to in all the six weeks.

Then we went in to recruit, to get potatoes, onions, and other fresh vegetables. In the morning the wind was from the northwest, with a light, moderate breeze. We discovered a whale a long distance ahead. We got our breakfast as the vessel was heading along that way. We saw the whale when it went down, and we lowered our boats and rowed out to about where we thought the whale disappeared. The captain said we better stop rowing, and we stopped. Pretty soon the whale came up close to the mate's boat, and he pulled on and fastened to it. It was a monstrous great whale. At that time we used what we called "drogues." We took pieces of thick board about 15 inches square, the boards crossing each other, with a square hole through them. Then we had a piece of hard wood with a shoulder to it, and had a rope strapped to it, so that when we threw the harpoon into the whale, having a warp 6 or 8 fathoms long, if the whale took to running she would have this drogue to tow through the water. We worked on that whale for an hour and a half and it never went down. At the end of the hour and a half we had got in six drogue irons. The whale ran on the top of the water very swiftly. We could not get near enough to the whale so that we could hurt it at all. We lanced it above the hump or behind the abdominal cavity. By and by the whale went down and took about 400 fathoms of line. We carried 220 fathoms in each boat and we had put the two together. I think we had 40 fathoms left. At this time the whale was a good ways off. Whenever we attempted to approach him he would start. He went down six or seven times, and the last time the warp parted and he carried everything with him, and we never saw him again till he was miles and miles away. If we had not put in the drogue irons we might have held him up alongside and killed him. The next day we landed at Pico to get some grapes and figs. All the whales we got made about forty barrels of oil. That was all we saw at the Azores.

The captain then conceived the idea of stopping out over winter. As the other vessels were coming home, one spared us a little bread, another a little meat, and so we recruited out of the other vessels. We left the Azores early in September and went to the Cape de Verde Islands. When we arrived there we had pretty good reports. We went down to the Isle of Sal, which is a salt island. There was no very good anchorage there on account of there being some sharp rocks at the bottom, and we had hemp cables. During the winter while staying here we got our cables chafed off several times. We remained here until the 10th of February. The wind was blowing

most of the time, the regular northwest trades. It finally blew so strong that we couldn't hold, and we went into Madeira Bay and lay there two or three days at a time in the heavy wind. When the wind subsided we went out and worked off the windward of the islands. We went out, I think, some time in December, and got off to the windward of the Isle of Sal, and one Sunday morning we were surrounded with whales. We were not in the habit of whaling Sunday. Some of the crew were anxious to go out and some opposed it. Suffice to say the captain was opposed to whaling Sunday and didn't go. But some of them swore a good deal that night. The captain said we were going to have a good spell of weather, and there were so many whales we could get a good many.

The next morning we had splendid weather, but we never saw a whale all day. Then, Tuesday morning we were surrounded by whales. We were only a few miles to the northward of the Isle of Sal. There was the biggest school I ever saw. We lowered the boat early in the morning and went out and fastened to a whale. We soon killed it and took it alongside and went to cutting it in. The captain then thought if more whales came along we would try to get another that day. The one we took made 28 barrels. He sent me aloft to look out. I was then a boy fourteen years old. It was the fall before I was fifteen. I kept looking, and discovered, away to the northward, whale spouts. I sung out, "Towno!" The captain wanted to know where, and I told him off the weather bow. He came up and saw them. He said, "Let me know when they go down." I told him, and he saw what o'clock it was, and by and by he said, "Keep a sharp lookout." Pretty soon I saw them coming up, about half a mile away, and coming towards the vessel—right at it. We then rowed out, and we had not been out more than five minutes when up came one, close to us. We let the boat run, keeping close to them. There were about a dozen of them. Just before we got to them one of them dropped his tail down and brought his head up ten feet high and hung there. Our boat-steerer wanted to go ahead. He was a young man, and the captain said he expected to head the boat himself. But the young man said he wanted to go in the head and to strike the whale. He did so, and we shot up alongside of the whale and threw the first harpoon. We have two; one called the preventer iron. He threw both of his harpoons, and thought the first one went into the whale some, but the second he knew didn't go in. The whale went off about a hundred yards, and out came his harpoon, and away went the whales, and that was the last of them. The next day the wind began to breeze up. We were to the windward of the islands when I discovered a bunch of whales to the east of us. I gave the alarm and we stood towards them. We soon found there was quite a number of them. We got where they were and went out and fastened to one of them, a fifty-barrel whale. She made pretty good play, and I don't remember whether they drogued her or not. I think they didn't put any drogue irons into her; but we lanced her, and pretty soon she began to spout blood. I was in the mate's boat. We didn't have a full crew. The captain said to the mate, "You better go aboard and unbend the cables from the anchor and have it ready to put around this whale's flukes." We set about to go aboard, and she went down as plump as she could. We bent on our warp after she went down and had taken as much rope as she wanted. When she came up she didn't spout any blood at all. We set out to go up and lance her, and as quick as we tried to do it she turned her head at us. We couldn't get any lance into that. The blubber is composed of what is called white-horse. When we got near her she would turn her head around, throw her jaw out, and come up at the boat. We watched her and tried to get a chance at her. Then they threw a drogue iron right into her breast, when she gave chase to us with her mouth open. We backed away, and didn't know but we should be eaten up. Then she turned right around, and I tell you she made the splinters fly. She went off with the head of the harpoon in her. We had a small sail, and just

after dark we got aboard of the vessel and went into the harbor. There we lay about three days. The next good spell of weather we went out again. We beat to the northward, when we saw something black stretched along out there. We went to it and found it was this whale. She had been dead four days, and had swelled up so much that she was as high as the brig's rail. We made fast to her and secured her. We ran down by the bend of the island, and before morning we were at anchor in smooth water. The captain said, "If we cut this whale, as soon as we cut into the case the oil will run out. The only way we can do is to scuttle the head on the broad side and then get in there and dip it out." We did so, and bailed out ten barrels of liquid oil. It was limpid and clear. Then we undertook to get off the blubber. This was a very fat whale, and when we hooked on to hoist up the blubber the oil would come down faster than any rain-storm I ever saw. We blocked up the scuppers as well as we could and dipped two or three barrels off the deck. After stripping it, we let the carcass go. We staid until the 10th of February. We then ran down to Buena Vista. Then we went to Brava, southwest of the Cape de Verde Islands, and then bore off to the West Indies and went to Martinique. There we found a brig that belonged to New Bedford, Captain Phillips. He was captain when there was no whale in sight, but Captain Warren was captain when there were whales. When we got to Martinique we saw some whales. We lowered a boat and went out and struck a whale—a humpback—and finally killed it and took it alongside the vessel and cut her in. After we had cut up the whale we went and anchored in one of the coves between Saint Pierre and Port Royal, and there we lay and tried it out. That whale gave us five barrels apiece. Then we started for home. On our voyage we had fair weather and were twenty days from Martinique to Provincetown, arriving on the 27th day of March. We sailed the 3d of April the year before. My share was \$20. I wanted to go whaling again, but father said, "You can't afford to go," and that wound up my whaling.

The whalers all broke down here then. There was one, Captain Soper, master of the Ardent, who went the next year and coming home he was capsized in a hurricane and four of the crew were washed off. The remainder staid on the brig, and five, after remaining on the wreck twenty-six days, were taken off alive and carried to England. The mate died, but Captain Soper and three men got home. All have since died except one, who is in Fernandina, Fla.

Then I had to go to sea somewhere, and I shipped in the schooner Favorite again, but not with the same captain. They generally hire as cheap as they can. Sometimes the parties who hire crews give them their boots. I got \$12 a month and one boot. She was a schooner of 80 tons, Reuben Ryder, master. I think we carried 160 hogsheads of salt, and that multiplied by eight will give the bushels. We sailed from home about the middle of May. We proceeded first to the northern coast of Newfoundland and made a stop at the Bay of Islands, where we commenced fishing with clam bait. We carried the clams with us. You see it was ahead of the capelin school. After fishing a week or ten days we then proceeded northward and arrived at Indian Harbor, the other side of Grosswater Bay. Soon after we arrived, the capelin came upon the coast, and we wet nearly all our salt during the capelin school, which lasted some three weeks. Having some salt left we proceeded homeward, stopping at the Straits of Belle Isle at a place called Henley's Islands. The capelin were gone and we were compelled to fish with sand-eels or lants (*Ammodytes*). There we finished all our salt but a few bushels, left the coast, and proceeded on our voyage homeward. We arrived home about the 20th of September from the voyage, and the fish were brought home in a green state. That ended my voyage. I had earned my \$12 a month and a boot, and got my discharge. Then I commenced in the shore fisheries, fishing for dogfish and mackerel in the fall and in the winter fishing for cod. That completed 1823.

After fishing through the winter and spring I shipped again to go another new voyage in the

schooner-Independence, of Boston, Capt. Lewis L. Smith. The crew consisted of Lewis L. Smith, master; Daniel Smith, father to the captain, and Lewis and Daniel Smith were his sons. The cook was Daniel, and that was his grandfather's name, and he was on board. Then there were Atkins Smith, the captain's brother, and Job Hill, the captain's brother-in-law. Then there were Ambrose Hill, Job's son, and I. We sailed for the Gulf of Saint Lawrence on the 27th of April. That was too early to get into the Gulf for ice. We first harbored in Barrington, near Cape Sable. Then we made a move eastward and harbored in Liscomb's Harbor. The next move we got to Canso, where we remained several days. The northern part of the straits was filled with ice. After some days of southerly wind, the ice drifted northward and we made another move along, harboring again at Port Hood, where we were detained a few days. We were bound for the Magdalen Islands. We got about half-way, and had to come back on account of the ice. After a few days the ice cleared so that we reached the Magdalen Islands and went into harbor. The vessel went out into the gulf and brought their fish to shore as soon as they got part of a fare, and they were cured by a Frenchman living on the island, who received 10 per cent. for curing them. We didn't fish any to speak of at Magdalen Islands, but we went over to Bank Bradley fishing, also to North Cape, Prince Edward Island. We didn't get more than two-thirds of a cargo of fish, and when it came time to come home we left the Gulf, notwithstanding some 40 hogsheads of salt were not consumed. After taking the fish on board at Magdalen Islands the schooner sailed and arrived home in the latter part of September. When I left the vessel I engaged in the shore fisheries through the autumn, winter, and following spring. This completes 1824.

The next spring I shipped in the schooner President, Ebenezer Atkins master. That schooner was 84 tons, and carried 160 hogsheads of salt. During both of these voyages we fished wholly with mackerel bait, and we could catch as many as we wanted. The mackerel were caught with jigs, there being enough offal thrown over from the decks to keep them on the surface. We nearly always took the spawn of codfish and used it for mackerel toll-bait to keep them at the surface. We fished mostly on Bank Bradley, off North Cape, Prince Edward Island, and along the west shore from Escuminac Point to Point Miscou. We finished our salt and then commenced our homeward passage, arriving home the latter part of September. When we were on the way home I was looking out to see the barren and sterile sands of Cape Cod come into view. After arriving in Provincetown the fish were washed out by the crew and delivered to the owner for preparing for market. I engaged in the shore fishery until the fish were ready for market, when I again joined the vessel. After taking in the fish, we went to Boston for market. The cod-fishermen then went up and tied alongside the Long Wharf. The dock came up to the Faneuil Hall building. Where the Quincy Market building now stands, there was water when I first went to Boston. When I was on the Independence the vessel's jib-boom extended up to North street (Ann street it was called then). Our vessels went up there and hauled up to Long Wharf to wait for a buyer. They kept coming, one after another, until there was quite an accumulation of vessels there. The meat they ate was chiefly sheep, and they would buy them for 12½ cents, but they used to generally give about 25 cents. There was at that time considerable work for the crews in unloading vessels while they were waiting for a purchaser to buy their fish. We sold the fish for \$2 a quintal. I made \$150.

I was engaged in the following year, during the spring, in fishing for codfish at Race Point. In the winter the fishing was in Cape Cod Bay. I shipped then in a new schooner belonging to Wellfleet, the Aurora, Capt. Freeman A. Baker, master. She was a vessel of 55 tons and was built at Newburyport. We engaged in the mackerel fishery on the New England coast from Cape Cod to Mount Desert. On that voyage the vessel came over from Wellfleet and took me aboard,

also my brother and another boy, and sailed the 29th day of June, 1826. On the first day out, about sunset, we discovered a school of mackerel. We luffed to, threw bait, and called the school alongside, and got some 5 or 6 barrels. That is the first fishing that ever I made jigging. From this we proceeded to Cashe's Ledge and in some two or three weeks we got 150 barrels of mackerel; after which the mackerel ceased biting, and there was ten days passed, and we never got but two barrels of mackerel cruising from Cashe's Ledge to Mount Desert; after which we fell in with mackerel off Mount Desert and soon completed our cargo. We then proceeded for Boston. We arrived in Boston the 2d day of August. We were gone just five weeks. We carried altogether butts, that is, molasses hogsheads, and a vessel of any great size would have four tiers of hogsheads. We took those barrels on deck to strike the mackerel in, to dress them in, and to soak them in. We only carried twenty butts, and the remaining fish were salted and barreled just as they do now. We arrived in Boston and packed our mackerel out. We had 238 barrels: 38 of No. 1, 23 of No. 3, and 177 of No. 2. These mackerel were sold for \$4.25 for No. 1, \$3.25 for No. 2, and \$2.25 for No. 3. Inspection cost us 92 cents a barrel. The inspector hired the butts. After a day or two we packed out and the vessel came home. We were in a hurry to get out. The wind came on from the northeast and kept us ten days, after which the wind hauled to the southward, when we left for the fishing ground. The wind changing to the eastward we bore up for Cape Ann and remained in the harbor of Gloucester for a week; after which the wind changed to the westward and we left the harbor. We arrived off Mount Desert and it came on a storm and we landed in Cranberry Islands. We had got 26 barrels in getting so far on our voyage. After leaving the harbor the next day we proceeded eastward. The 11th of September we got 38 wash barrels, the 12th we got 45, the 13th of September (which was my birthday) we got 51, on the 14th we got 28, and the next day 24. The wind then came on from the eastward and we bore up and went to Cranberry Islands again, with 140 barrels of mackerel. When the weather became good again we went out and found plenty of mackerel, and completed our cargo. We proceeded to Boston, where we packed out 253 barrels. We had 177 barrels of No. 1, 8 barrels of No. 3, and 68 barrels of No. 2. As we were going into Boston we hailed a mackerel schooner that was coming out, and they said that mackerel were worth \$3, \$4, and \$5. Our skipper remarked that if they kept as high as that he wouldn't ask any more. He would get rich enough. The crew made \$105 to a share.

Then we made another trip, the third, fishing between Cape Cod and Cape Ann, on what is called Stellwagen Banks. During fall we got 225 barrels more that we packed. About 190 barrels were No. 1, and the rest No. 2. The last day we were wide off shore from Marblehead, on the 20th of November, and caught 20 wash barrels. Then it began to snow and we came into Boston Harbor. The next morning there was ice over the wash barrels. We went up then and quitted the voyage. I made \$200 for the three trips. That following winter and spring I engaged in the shore fishery.

Early in June I went to Boston and took the schooner Missouri, 33 tons. She wasn't very big. This was my first trip as captain. After fishing about a month for codfish we abandoned that and fitted for the mackerel fishery on the New England coast. We had two men beside myself, and two small boys, and got about 200 barrels of mackerel during the season. We closed up our fishing about the middle of November. We jigged the mackerel and sometimes picked up a few barrels with a gaff. When we fitted in the fall I bought a quarter of the vessel, for which I paid \$100. The next spring I started codfishing in our bay about Cape Cod. About the 1st of May we left off fishing there and fitted for the Gulf of Saint Lawrence cod fishery. We carried 45 hogsheads of salt. I don't know what time we left the Gulf. We wet all our salt. On our arrival

at Cape Canso we were short of provisions, but I supposed we would not be more than a week, but we were fifteen days, so we were half starved when we got home. After landing our fish we fitted for the mackerel fishery, and I was employed in that until the middle of November, 1828. In the winter I engaged in the winter fishing in the same vessel. We went to the north shore off Lynn and remained there six weeks. I made \$12. We came home and the vessel was laid up until the next season.

By going four months out of the nine, exclusive of the winter, we obtained a bounty at the rate of \$4 a ton on the vessel's measurement. We commenced early in March and fished until about the 1st of June for codfish; after which we engaged in the mackerel fishery until November on the coast of Maine and Massachusetts. Then we went bounty catching about a week or ten days. We called it bounty catching because we shouldn't have gone if it hadn't been for the bounty. After spending the winter at home I was still in the Missouri, and in the spring engaged in the halibut fishery along the shores of Cape Cod and Nantucket Shoals. At that time it took only a small quantity to glut the Boston market with halibut. The most we got was 3 cents a pound. I have carried 2,000 weight, and when I got to Boston would let them (the dealers) come into the hold and pick out 1,000 weight which I would sell for half a cent a pound and throw the rest overboard. Some vessels couldn't sell their cargoes at all. The reason of this was because Boston was small in population. Ice never had been used for icing halibut; but was used only in the city of Boston, and that was as far as they could be carried without ice. Gloucester was not engaged in the halibut fishery at the time, so that we, particularly Wellfleet, supplied the Boston market with halibut. The halibut season commenced in March and lasted until July. When mackerel got fat there was no sale for halibut.

Early in June, 1830, we fitted for the mackerel fishery. We went first off about the vicinity of Cashe's Ledge and fished from there to Mount Pleasant Rock. We got a trip of 100 barrels and were absent four weeks. I think we made \$30 to a share. There were three men, including myself, and two boys on board. It was the custom of mackerel vessels to carry stone ballast in the bottom and stow the barrels on the top of the stones. We threw out the stones and only took in and headed up 12 barrels of stone, and stowed the vessel full of empty barrels and salt.

We sailed from Provincetown the 1st day of August. On the following day, at 9 p. m., it commenced to blow a gale from the northeast. We were just near the western edge of George's Bank. It blew so hard the vessel could hardly stand up, and lay over on her side, and we were pretty scared. The gale moderated, however, the next morning. When we had been out a week we had 2½ barrels. The vessels fitted out for short voyages, from one to six weeks. When we were out two weeks we had 16 barrels. It looked pretty blue. One-third of our time was gone and we had caught only 16 barrels. We then ran eastward down off the coast of Grand Manan, and when three weeks were out we had 60 barrels. Afterwards, for some ten days, we caught very few mackerel, and proceeded westward. When off Mount Desert hills, bearing about northwest, we fell in with plenty of mackerel and filled all our barrels. We arrived in Boston after an absence of about six weeks, with 127½ barrels. We had 83 barrels of No. 1, and the balance No. 2. There were only about 2 barrels of No. 3, and we didn't pack them, but kept them for grind bait and toll bait. We shared clear \$103. We got about \$6.50 for No. 1, and \$5.50 for No. 2. Our outfits were very light. The vessel drew one-quarter.

We then fished in Massachusetts Bay between Cape Cod and Cape Ann and got about 75 barrels, which closed the year's fishing. We thought that was doing pretty well, and the owner wanted me to leave the vessel and take a larger one. He bought a new vessel on the stocks for me, of 75 tons, but he had no written contract and the fellow backed out because the price raised and

wouldn't sell. I went to Boston in March, expecting to have that vessel. About the last of March the schooner *Mary* arrived from the West Indies and I took her and fitted for the Grand Bank. We sailed from here the 11th of April for the cod fishery. We depended at that time more particularly on mackerel fishing. All the Provincetown Bankers came in early so as to be ready for the mackerel fishery. This was not the case with Plymouth and Marblehead, which were engaged exclusively in the cod fishery. That April, May, June, and half of July were spent on the Banks fishing for codfish, and on the return the vessels fitted for mackerel fishing, and in the fall at the close of the mackerel fishery they put in the remainder of the four months in cod fishing in order to secure the bounty. We had eight men and a cook, so that we fished half and half, having four for a dress gang; one to throat, one to head, one to split, and one to salt. They exchanged places every watch of two hours. The fishing was all carried on from the deck of the vessel. We carried salt clams for bait and generally took about 20 barrels. We returned home about the middle of July; after which we engaged in mackerel fishing on the coast of New England from Cape Cod to Mount Desert. During the summer we caught 400 barrels of mackerel. We quit fishing in the early part of November, 1831, to make out the rest of our time to obtain the bounty. We made \$163 to a share. We could live very well with a family then on that, if the family wasn't too big. I staid ashore that winter and didn't go fishing.

On the 2d of February, 1832, I sailed for the West Indies as captain of the *Mary*, although I had never been engaged in the coasting trade and knew nothing about it. We were bound for Ponce, Porto Rico. After landing the cargo we engaged a freight of molasses for New York. We arrived there about the first of April, and from there we went to Murfreesborough, North Carolina, in ballast, after a cargo of white-oak pipe staves for Boston. We arrived in Boston with our cargo and then proceeded to fit for the mackerel fishery. That year the mackerel were poor and scarce and we made a small voyage, only making \$10 apiece. We left the vessel in the fall.

In January, 1833, I had a new schooner called the *Caroline*. We loaded on the owner's account and went to Ponce again. After discharging our cargo we loaded with sugar and molasses for New York and returned without incident. Then we chartered to go to North Carolina and load with red-oak hogshead staves for Falmouth, Jamaica. After discharging cargo we went up the river to Tobasco, Mexico, in ballast and loaded logwood for New York. After having an ordinary passage to New York we took in ballast for Boston. This year it was so late that all the good men were employed, and I preferred to leave the vessel and go fishing with my brother, who was then on a cod-fishing voyage. So I went with him mackerel fishing on the schooner *Nelson*. We sailed about the middle of July and ended about the first of November. We made \$120 to a share. There were seven men in the crew, but three of them were hired. These were paid about \$10 or \$12 a month. The owner wanted me to take a schooner called the *Lucretia*, on shares, and go to North Carolina and get freight, and I took charge of her. She was a vessel of 77 tons. I sailed the 26th of December. I started to go to Ponce again with red-oak staves and cypress shingles, and then I agreed to return with a cargo of molasses for the same parties. I staid at Ponce twenty-nine days, and subsequently loaded with molasses and returned to Edenton, North Carolina. On my return I received instructions from my owners to purchase a cargo of red-oak hogshead staves, which I did, and returned to Boston for the fishery. I gave up the vessel in Boston. It was an unprofitable voyage. I lost my time and \$50.

Then I shipped again with my brother to go mackereling on a schooner called the *Lucy Mary*. We had five on shares and the rest were hired. After going out and spending some three weeks, and being off the coast of Grand Manan, my brother was taken sick with fever and we brought him home. We only got half a dozen barrels of mackerel. On our arrival home I then took

charge of the vessel. First I went to Chatham and found nothing, and then went into Massachusetts Bay and fished on Middle Bank, and in about three weeks got a trip of 160 barrels. We went into Boston and packed them out. We fished a second trip in the bay, between Cape Cod and Cape Ann, and caught about 150 barrels more. At the end of the season, 1834, we hauled the vessel up.

I sailed in the schooner *Lucy Mary* on the 28th of April, 1835, for the Grand Bank, and was absent 11 weeks and 3 days, obtaining 600 quintals of fish. The *Lucy Mary* measured 59 tons O. M. (about 38 N. M.) We carried three sharesmen, and three men and a cook, hired at a cheap rate, and made \$200 to a share. On our return we landed our fish, which could not be cured at that time of year, salted them in kenches, and put them in the store to wait for cold weather. After this we fitted for mackerel fishing in the Gulf of Saint Lawrence. We shipped one more sharesman and sailed August 2, fished for a while about the Magdalen Islands, and returned home about the middle of October with 180 barrels of mackerel. We fished for the rest of the season for cod and mackerel in Massachusetts Bay, making \$220 after the 2d of August. After the end of the season we carried our codfish and mackerel to Boston and sold them, the codfish selling for \$2.75, the mackerel for \$7 and \$8. I spent the winter at home. I didn't feel like going fishing, and went to building dories, which, at this time, were just coming into use. (See account of dory business elsewhere.)

In 1836 I was still in the *Lucy Mary*, my brother, John Atwood, master, and we started in the spring for the Grand Bank. We sailed the last of April, and after a short passage of six days anchored on the Grand Bank. In the first two or three weeks we caught between 4,000 and 5,000 fish. Then it came on to blow heavy from the north and northeast. We were at an anchor, and as many as twenty vessels—square-rigged French brigs and American schooners, all catching some fish—were around us. The blow lasted nine days, and when it was over there was not a vessel in sight, all having drifted away or been obliged to change their berths. The wind brought down hundreds of great icebergs, which were floating all around us. We got our anchor and ran for the eastern end of the Bank, but we met a vessel which said that it was full of ice there, so we ran to the north, and there, on the edge of the Bank, between latitude 45° and 46°, through the whole voyage, when it was clear, we could see twenty icebergs or more floating all around us. We were frightened almost to death all the time, particularly when the fog shut down thick, but none of them came foul of us. The ice was there as long as we were. When we got home we had been gone eleven weeks and three days, and had on board 572 quintals of fish. This year my brother and I had fitted the vessel and hired the whole crew, paying \$18 apiece a month for three men, \$16 for one, and \$8 for a cook. We made \$460 to a share. On our arrival home we discharged all our crew, and my brother and I landed all our fish ourselves and put them in salt. Then we got on board the salt and the barrels and everything for the Gulf of Saint Lawrence. We sailed on the 1st of August, and on our arrival we could not hear of any mackerel being caught. We spoke vessels from Bank Bradley and Prince Edward's Island and Gaspé, but they all said there was no fishing. So we bore up and went to the Magdalens. When we got there we found that they had been catching mackerel the day before off Black Land, near Tantenore, off the northwest coast. So the next day we went down there. We found nothing till we got to the east end, and there we caught a few. The wind blew up to the northwest heavy and drove us around to the west of the island, where we anchored under the lee. The next day the weather moderated, and then we could get no mackerel at all. Then we bore up and went to Newfoundland. We went as far as Port au Port, and never caught a mackerel—not a mackerel. Then we went back to the Magdalens as quick as we could get back, and fished there for the rest of the voyage. We returned home

about the 10th of November, and packed our mackerel—192 barrels of No. 1 and 33 of No. 2. After packing the mackerel out we took them in and carried them to Boston. They were then worth \$7.31 and \$8.31. We concluded not to sell, and brought them home, and laid up the vessel alongside the wharf to wait for them to raise. In February we went up to Boston, I think, again, and they had raised \$1 a barrel, so we made \$225 by keeping them. From this trip we netted \$430 to a share, or \$890 for the whole voyage. This was a big year for us.

In the spring of 1837 the owner of our vessel sold out to go into the commission business. He had a large packet called the *Tam O'Shanter*, a brig; and when we were in Boston to sell our mackerel in February he asked me to take charge of her. So I shipped in the brig, and came down home to get my clothes. The first voyage was to Savannah, with an assorted cargo. I hired at \$50 a month. We left the 27th of March, and returned to Boston with a cargo of cotton. This was the time of the panic, and we could get no freight, so we chartered to go to St Thomas to look for freight there. There was no freight there, so we went to the island of Bonaire and loaded with salt for Boston. We loaded deep and came out through the Mona passage. The next day came a hurricane. What a time that was! It blowed away my sails, split off seven stanchions, water-ways, and the bulwarks, and it was all we could do to keep her afloat. She was leaking badly, and the crew could not leave the pumps. I lost my mainsail, and had to lie to under a close-reefed foresail. Then it died away a flat calm and held calm six days. Then it breezed up fair, and we came up to Boston. We left home early in September. The brig was next chartered to go to Port au Prince. My folks would not let me go, because it was sickly there, and I engaged for the rest of the fall in fishing for dogfish and mackerel, and that winter I went winter fishing until March, 1838, at which time we had got into the habit of going fishing in dories.

In 1838 my brother John and I bought a pink-stern boat of 46 tons, called the *Orlando*. She was an old cheap thing, but we thought she would do to putter around the shore in. So we let our schooner out to go to the Grand Bank. We fished around the shores of Cape Cod and on Nantucket Shoals for cod and halibut, and carried them to market. Then in May, when the dogfish began to trouble us, we came inshore to fish for mackerel, which were plenty along the Truro shore. We fished until June, and then went to the Gulf of Saint Lawrence. Our sails were so poor we did not stay there long, and we got only about 20 barrels. We returned home, and fished along our bay for the balance of the fall. That winter I didn't go fishing. I didn't feel very well, for I had hurt my knee in the summer. The folks over on the Point had got disappointed in their school teacher, so they got me to teach school, and I got sick enough of it. I had about thirty scholars.

In the spring of 1839 we got another man to take the *Orlando*, and I took the *Lucy Mary* and went to the Grand Bank with one sharesman and a cheap crew. I didn't go very early, for I fished on the backside of Cape Cod the first part of the season, and sailed for the Grand Bank about the 6th of June, returning about the middle of September. That was one of the years when mackerel were scarce. As the prospect looked so bad for mackerel we concluded to wash out the fish and lay up the vessel. So John and I cured up the fish. We could do better at that than to hire them cured and go mackereling. When we arrived home with 557 quintals, fish were worth a good price, \$3.50 a quintal, but when we got ours cured they had fallen to \$2.50. We concluded we wouldn't sell them, but keep them until spring. In February, 1839, we took the *Lucy Mary* and went fishing for halibut in the gully between the cape and the middle grounds at a depth of 20 to 30 fathoms. We fished there in the spring, and then went down the backside of the Cape after halibut and cod. After the season was over I took in my fish and carried them to Boston, and could hardly sell

them at all. I sold 300 quintals at \$2 a quintal to one dealer in Albany, and another Albany man took half the rest on condition that I would ship the remainder, which I did, and got \$1.71 a quintal for them. So on that Grand Bank voyage I made only \$50.

In 1840 mackerel were extremely scarce. People who had been whaling at the Azores said that they were plenty there, and large ones, so I conceived the idea of going to the Azores in search of mackerel. We fitted out the vessel and I went there with a crew of five men, all sharesmen. We found no mackerel there, but a sort of bonito, probably the *Aurix rochei*, so I got home as quick as I could. So we hauled up until winter and then we fished in the gully for halibut. Only one other vessel, the *Adrian*, was fishing there, and we did very well. We had the monopoly of the Boston market, for at that time the Gloucester vessels did not begin the halibut fishery until the 1st of March. Sometimes we got 10 cents a pound for the fish.

In 1841 I was still in the *Lucy Mary*, and in the spring we went off Monomoy and Chatham and fished for shad. This was a new kind of fishery. Years before, when I used to go there for bait, I saw a man catching shad, but could get no information from him, and it was evident that he tried to be shy. In 1840 we mistrusted they were catching shad there, and two or three vessels went down there from Provincetown, and fished with others from Chatham and got a good many. In 1841 great preparations were made for catching shad, and vessels went there from Connecticut, Rhode Island, and all around. A petition was sent to the legislature to prevent out States folks from fishing. The law passed, but the fishermen came nevertheless. The law must have scared the shad away, for none came there that year. We found no shad at Monomoy, so we went over to Nantucket. We got a few in the course of our absence of three or four weeks, or we should have made a broken voyage. The *Lucy Mary* was high boat, for we ventured out in rougher weather than the others. We had four boats and eight men, and made about \$60 to a share, my brother and I. Shad were worth about \$7 a barrel, and weighed 3 or 4 pounds each. They came late in May and early June, and were not there more than a fortnight. When fishing for them we went out in small boats and drifted, each boat carrying about 800 yards of gill-net, which we made ourselves on purpose. The year before everybody had done well. After the shad had left we returned and engaged in the mackerel fishing. This year, before the nets were set, mackerel had been seen outside the cape, and we concluded to drift for them as we had for shad, and made a good thing of it. We used common mackerel nets, each boat setting ten nets of 60 yards each. We used to put them over and let them drift all night, and in doing this we found an everlasting sight of whiting, which were very troublesome. We sometimes had to draw in our nets for fear that we should catch so many whiting we couldn't haul them out the next day. We used to get tons and tons of them. They had always been plenty and staid until the bluefish tipped them out. We made perhaps \$100 in mackerel netting, sending them to Boston fresh, and paying a quarter for carrying them. After the spring mackerel net-fishing was over, we fitted the *Lucy Mary* for the Gulf of Saint Lawrence. We shipped a crew of seven men, all sharesmen. This was one of the awful scarce years for mackerel, and only 55,000 barrels were packed in the whole State. We went direct to the Magdalen Islands, fished down to the eastern end and staid there and kept catching a few on the ledges. They were good mackerel what we did catch. We kept hearing from the west shore of the gulf that there were no mackerel there. We staid until October and then came out with 100 barrels. That was as well as we could have done at anything, for mackerel were considerable high. We got a good price and made about \$100 apiece. In the winter we went halibuting again.

In 1842 I got a letter from Dr. D. H. Storer, of Boston, saying that he was preparing a book on the fisheries of Massachusetts, and asking about the torpedo, which he had heard occurred on

our shores. I knew all about it. I supposed, having been a fisherman so long, I knew a good deal. He was a doctor of physic, and I thought I would aid him without any pecuniary pay, and he accepted. After I had answered questions about thirty-two kinds of fish he sent me his report, and said that was all they knew about fish and anything I could do would be important. I looked over it and found that I could do a good deal, and this was the beginning of my acquaintance with scientific men.

In 1842 I was fishing for halibut and cod on the backside of the cape, but left off soon enough to go shadding again, a second time, at Monomoy, from the last of May to the 20th of June. We had our nets already made and could go without any additional cost of outfit. We were unsuccessful and made only about \$20 to a man, the crew consisting of eight men. There were probably fifty sail of vessels off Chatham fishing for shad. After this was over we commenced mackerel dragging in the bay, and continued it until the middle of July. Then we fitted for the Gulf of Saint Lawrence, sailing the latter part of July. We fished altogether at the Magdalens and got only 60 barrels; but this was a good share compared with other vessels. There were very few Provincetown vessels in the mackerel fishery that year, they being engaged mainly in the cod and whale fishery. There were a few from Cape Ann in the gulf with us. We returned home late in the fall, and our profits were very small.

In the winter, from the 1st of February, 1843, to May, we fished as usual in the gully for halibut, and went to Boston eight or nine times, sometimes carrying 5,000 or 6,000 pounds of fish sometimes not more than 2,000. About this year we began setting trawls for halibut, as has been described elsewhere. Before we began trawling we carried ten dories and eleven men, one man staying on board while every other one of the crew took a dory and went out to fish with hand-lines at various points within sight of the vessel. After trawling began we carried only five dories and sent two men out in each of them. When we first began fishing for halibut in the gully the fish would weigh on an average about 135 pounds. This was in 1838; but after we had fished there three or four years they didn't average more than 75 pounds. We used haddock for bait. After we got through halibut fishing there was no encouragement to fit for mackereling. Our vessel was old and would not pay for repairing, so I went to Saint Pierre and sold her to the French for \$600. I ballasted her with brick, which also brought a good price. That wound up the old Lucy Mary.

In the spring of 1844 I commenced to fish in a little old sloop which my brother had bought. It wasn't good for anything, and was called the Mars. We had a crew of two men and a boy. We fished on what we called Mill Ledge, not more than a mile from Highland light, in from 14 to 25 fathoms of water. We caught about 500 or 600 weight the first day out, and as we couldn't get them into the well alive we struck them with a club as big around as my arm, and then put them into the well dead. The wind sprung up and the next morning it was still blowing fresh. We started to haul our dead halibut up to dress them when to our surprise every one of them was alive! We hit them as hard as we could. On this trip we made \$100 to a share.

After the spring fishing was over we then engaged in the mackerel net fishery for the season. The mackerel came in here to spawn the latter part of May and through the month of June. We didn't use the sloop in this fishery, but had a boat.

The plaice, *Platessa oblonga* of Storer, was extremely abundant here then. At that time there were a great many squid, and the plaice fed on them. We caught 2,000 plaice in one afternoon. We sold them in Boston for turbot. Here and there we could find a marketman who would buy 150 or 200 pounds, but generally there was no demand for them. So we gave them away very frequently. After we went two or three times to Boston with plaice we found it wouldn't pay at

all. We could catch enough, but couldn't find a market for them. When bluefish came they became very scarce.

After we got through carrying plaice to Boston we went out in the bay and fished for cod and hake, and whatever we could catch, until about the 1st of September. We didn't like the sloop very well. We got tired of pumping. Hearing of a sloop for sale at New London I went there and bought the smack J. Sawyer, 33 tons. After buying that smack we brought her around in the fall of 1844, and commenced fishing in her, and fished into 1845. The 1st of January we were fishing for codfish. We had a crew of five men and carried four dories. The men were all on shares. We fished for cod in our bay and on Mid Bay Ledge, 7 miles from here towards Sandwich, the first of the winter and into January, 1845. Subsequently the fish left the ledge and we went out into deeper water off Race Point. After fishing till spring, about the 1st of April we went on to Nantucket Shoals with that smack for halibut, and I think we stocked about \$400 while we were there. We went four trips, about five weeks altogether.

Then we stopped at home to engage in the mackerel net fishery, and let our smack out to a man who carried the fish to Boston market fresh and got a quarter for carrying them. We fished in our boats in our bay, drifting for mackerel.

After that mackerel season was over there was no prospect of doing much here and we came to the conclusion to go down to the coast of Maine. We went to Monhegan, and the fishermen there said we couldn't catch mackerel in nets; but we went out in our dories and set our nets in the night. We were gone from home four weeks and made \$90 to a share. We thought that was doing pretty well and went down again, but the next time there were so many sharks that we couldn't do much and came home. The sharks would get in and tear the nets.

After returning home in the fall we set nets in our bay. We set them in the night and would draw them in the morning if the weather would permit. We fished in this way till about the middle of November and then fitted out for winter fishing in Cape Cod Bay. We fished for codfish in the bay and carried them alive to Boston market. In the spring of 1846 we engaged in halibut fishing as the year before. Then we let out our smack for a man to go in her to run mackerel while we fished for them in the bay. Then, after we got through with that, which might be about the 1st of July, we went to Monhegan as the year before. Several others went that year. We didn't do much. Returning home we fished with mackerel nets (gill-nets) here in the fall, until about the middle of November, when we commenced winter fishing again. (See Storer, *Fishes of Massachusetts*, pp. 58-174).

During the winter we had carried to Boston 3,999 cod, which weighed 51,263 pounds, and we stocked \$734.18. In the spring we caught 2,205 cod and stocked \$240.43.

We went cod-fishing in the winter until May 8, 1847. Then we went dragging for mackerel. This year we concluded not to go to Monhegan, so two of us took the smack and took two loads of lobsters to New York. We didn't do much with them. They died, for we didn't know how to take care of them very well. After returning, about the 1st of August, from New York, we commenced fishing for hake and pollock and fished way into the autumn. We didn't save the hake sounds then.

After that fishing was over we set mackerel nets until late in December and then commenced winter fishing again.

In the spring we went halibuting, fishing down on Nantucket Shoals until May. Mackerel catchers didn't do much, so that I didn't go at all to set mackerel nets. After the spring halibut fishing was over I commenced to carry lobsters to Boston. After the Boston trade fell off we then made five trips to New York with lobsters. We brought home fruit to sell. We bought the lobsters

here. We stopped about the 1st of September, 1848, and then commenced fishing for hake and pollock again. We did better at lobstering than we could at anything else. In the fall we set mackerel nets, but did not do much and fitted out for winter fishing as usual.

In 1849 we were in the J. Sawyer still fishing for cod in the winter and halibut in the spring. We had contracted to furnish lobsters to Boston, but we heard of cholera being at the south and the dealers backed out.

During the spring of 1849 I was in Boston selling codfish. We were accustomed to take our livers to Boston, and we sold them for 25 cents a bucket. Some parties came and offered us 37 cents. I made inquiry and found they wanted them for medicine, but I thought it was pretty coarse medicine. I was acquainted with doctors, physicians, and chemists, and I inquired about cod-liver oil, and they told me that it had been used in France for some years and was getting more common every day. Afterward I made a little oil and they said at Boston it was just as good as they ever saw.

I conceived the idea of going to Labrador to get cod livers, and Prof. Jeffries Wyman, Horatio R. Storer, and Frank H. Storer went with me. We started in pursuit of objects of natural history and the manufacture of medicinal cod-liver oil. It was late in the season, and most of the cod-fishing was over. I carried two dories. I got 300 gallons of cod-liver oil. We then returned home, and resorted to setting mackerel nets through the fall. My wife died while I was absent that voyage. This was the commencement of my manufacture of cod-liver oil, and I have been engaged in it ever since. I sold my smack when I came home, and in the spring of 1850 I bought the schooner William Gray, 58 tons, and fitted for Labrador. The main object of the voyage was to procure cod-liver oil. I carried 200 bushels of salt which I consumed on the codfish of my own catch. We got 20 barrels of medicinal oil. Then I returned home about the middle of September.

During that fall our fishermen were fishing for hake and pollock, and I commenced buying them. I didn't fish myself. I made \$200. My schooner was hauled up at this time. My brother had a schooner, the Ned Buntline, and I went fishing for cod in the bay with him in the December of 1850. We fished for halibut, and did very well. After I left the Ned Buntline there were some men who wanted to go halibuting, and I told them if they were a mind to get the schooner off I would go. They got her off and I put a new suit of sails on her and started about the early part of April. I shipped my crew upon their own hooks. Every one had what he caught. I got 2,000 weight of halibut and went to Boston and sold them for 2½ cents a pound. We then went to Nantucket Shoals, and we caught 67 halibut that day and they weighed 6,000 pounds. This was Thursday, and the next day the wind struck us northeast and we went to Edgartown. Monday we came out and by night we were off Chatham and we tried to get up by the Cape. The next morning it blew heavy and I run down and run in after sounding on the shoal ground of Stellwagen Bank. Finally we got here and anchored in Herring Cove. The wind increased that night and the next morning the schooner dragged her anchor. Then I put on another and she dragged that too. Finally I put out the chain anchor and that held her till the gale was over. That night Minot's Ledge Light was blown over. I then went to Boston and found halibut in good demand. The first sold for 6 cents. Then I sold some for 5 and sold the last for 1 cent a pound. We stocked about \$120. I owned the whole vessel and drew a quarter for her, so that I made a considerable good trip. After recruiting with bait we started out again and the first day we caught 67 again, and the next day we caught about 60, and the third day about 20 and started for Boston. Where I fished was in about 18 fathoms, Chatham Light bearing northwest by west. We went to Boston and sold our halibut for 5 cents right through. My share was \$175. We were gone five days. Then we went one other trip down there and got about \$100. Then we came home and fitted for the Bay Chaleur, Gulf of Saint Lawrence.

We sailed about the middle of July, 1851. We went down the coast of Maine and tried to get some menhaden but didn't catch much. After arriving in the gulf we went to the Magdalen Islands to fish and fished there until about the middle of September, when we went to Prince Edward Island. We took a heavy squall from the northeast. There were six vessels in company with us. We could see where the harbor went in, and I had a man aboard who had fished there before and who said he was just as well acquainted there as with Provincetown Harbor. One of these other schooners was half a mile ahead and one was behind. Then it got dark and I lost sight of these vessels. I saw a tremendous breaker ahead and I put Nat, my little boy, below and hauled to the north and luffed, and I hadn't run but a minute when I saw a sea coming from the other quarter. When that sea came along midships it broke right over us. The next sea that struck us didn't strike us so hard. She came working over till she came to the main beach of the island. She was up so high that the tide didn't wet her keel. I stripped her and sold her there. She brought most as much as she was worth. I was there a week. I went aboard another Provincetown vessel that was coming home and got off at Saint Peter's that night, and there came on what was known as the Yankee gale. I think it was the 4th of October, 1851. We hauled off that night and the next morning it was blowing a gale of wind. We sailed on till nearly night heading up northwest, and I saw a big breaker ahead. A sea struck us and took off our jib and flying jib and the boat off the stern. We were carried right up on the north part of Saint Peter's. I had twenty barrels of my mackerel aboard, which I saved. Then I finally came home in another vessel. I made pretty well that voyage. She was insured for \$600, and I got my mackerel out and shipped them for home. We made \$40 to a share on our mackerel, and did tiptop.

My brother was building a vessel at Northport, L. I., called the Golden Eagle, 80 tons. In the spring of 1852 I went fishing for halibut on Nantucket Shoals and took them to New York. Then we came here for mackerel fishing and this vessel carried them to Boston. Then we went to George's Bank for halibut in June, and carried our halibut to New York. We went two trips. After the two trips we fitted for mackereling—salt mackereling. We went off east of Cape Ann, and subsequently in the bay, and fished until the 1st of October, and then came home, and my brother took the vessel and went packeting to Boston and I set mackerel nets. In those winters I made cod-liver oil, but that didn't stop me from dory fishing.

When we returned from the George's in August, 1852, we stopped at Provincetown and took in 2,000 lobsters. There were three sharesmen and we each took our wives and children to New York to the World's Fair. There were eleven of us, and we stopped a week in New York.

In 1853 I was in the Golden Eagle on Nantucket Shoals, and afterwards went to George's Bank until the 1st of September, as the year before. In autumn I fished with gill-nets in our bay. I bought 200 quintals of hake and pollock.

In 1854 John, my brother, left, and I took charge of the schooner and fished for cod and halibut on Nantucket Shoals and George's Bank as the year before, and afterwards fished for mackerel from the shore. Then my brother-in-law took her and went mackereling.

In 1855, in the spring, I commenced dory fishing for cod, and preparing for catching mackerel with nets. I built a new boat, called the Ichthyologist, which cost \$240, for a drag-boat to drift with nets in the bay. My son Nat was going with me and seemed to think that there was small chance for me to be high boat, until I undertook to explain to him why I thought I should be. I said to him, "I know what the mackerel come here for. They come here to deposit their spawn. They spawn in the head of the bay, in 7, 8, or 10 fathoms of water. If you go up to the spawning grounds you will find them more numerous." Accordingly, we got our boat ready and on the 20th day of May we left and went up the bay into about 10 fathoms of water. There we put over our

nets just as it was dark. All the rest of the fishing boats went out southwest from the Wood End to pick up those scattering mackerel, except one that chased me. When we drew our nets in the morning I think we had 2,050 mackerel, when we returned home. The other boat, the one that chased me, got 3,000. We then put them on a schooner and sent them to Boston and paid one-quarter for carrying. Cf the boats that went off the Wood End the high boat got 140. My brother thought it was strange that he didn't get more; that he got his best night's work out there the year before, but he didn't remember at what time of the year it was. The following night it was still pleasant, and *all* the boats went up the bay. One of the vessels was afraid if they didn't haul their nets that night they wouldn't get any fish, so they drew their nets at 9 o'clock, and only got 1,500. When I hauled in in the morning I had 3,500. When I arrived I found that the vessel that took mackerel was all full, and I landed at home and salted them, and E. S. Smith & Co. gave me 2 cents apiece for them, so I got \$70. After the mackerel deposit their spawn in the head of the bay they want something to eat, and I thought that where there is the most bait is where the tide running into Cape Cod bay meets with still water. I went there and got a full fare. At the close of the fishing we were high boat. We stocked about \$320, which was about \$100 more than any other boat. After the fishing season was over, which terminated about the middle of June, I shipped in the schooner Wave Crest, Captain Doane, and went to Monhegan to catch mackerel with nets, and took my boat and nets with me. We fished with gill-nets, drifting off the island. The fishermen there took a great fancy to my boat and I sold her for \$240.

In the spring of 1855 I built a new boat. In the summer I went with that boat to Monhegan for mackerel, returning home the 1st of September. Then I fished from the shore for mackerel until late in the autumn. In the winter I engaged in fishing and making cod-liver oil.

In the spring of 1856 I built another boat and commenced about the 20th of May to drag mackerel nets, which lasted until about the middle of June. The 1st of July I received an appointment as commissioner to inquire into the expediency and practicability of the artificial propagation of fish. I located at Sandwich to watch the habits of the trout (*Salmo fontinalis*) during the spawning season. I had two colleagues on the commission with me, Hon. Reuben A. Chapman, of Springfield, and Dr. Henry Wheatland, of Salem. In the following winter we made our report, which terminated the commission. In November I was elected a member of the State house of representatives, which took me away from the fishing here.

When it came January of 1857 I went to the legislature, which was in session one hundred and forty-six days, and did not return home until June. On my return home I took the sloop-smack Federal and engaged in buying lobsters and carrying them to Boston until September, after which I was engaged in the shore fisheries in autumn, and the mackerel fishery.

The following January, 1858, I was returned to the house. After the close of the session I joined the sloop Federal and engaged in the lobster and bluefish trade, sending the fish to Boston until September. In the autumn I engaged in the shore fishery.

In 1859, in January, I was winter fishing, and in the spring I joined the sloop Federal again and engaged in the lobster and bluefish trade again, as the year before. In the fall I engaged in the shore fishery and mackerel net fishery.

The next spring, 1860, I again joined the Federal and went in her until about the 1st of June, when I went to Plymouth and there I swapped this smack for a better one called the Wave, by paying \$400 to boot. I continued in the same business, fishing and buying lobsters and bluefish when I could get them, and selling them in Boston, until the 1st of September. In autumn I engaged in the mackerel net fishery and later in winter fishing.

In the spring of 1861 I took the sloop Wave and commenced fishing for cod and halibut, after

which I engaged in carrying fresh mackerel and lobsters to Boston until September. In the autumn I was fishing for mackerel with gill-nets in Massachusetts Bay.

In 1862 I did not go fishing in the winter—only occasionally. In the spring I was fishing for cod and halibut again, and in the summer for lobsters and bluefish. In the winter I engaged in the manufacture of cod-liver oil; in fact, I did so every winter. In the fall I set mackerel nets.

In 1863 I was in the sloop *Wave*, and engaged in fishing the same as the year before.

In 1864 I was in the *Wave* off Cape Cod in the spring and carrying mackerel and bluefish to Boston until September. In the winter I engaged in the manufacture of cod-liver oil.

In 1865 I was still in the *Wave*, engaged in cod and halibut fishing in the spring, and carrying fresh mackerel to market that we caught in gill-nets here, which lasted until about the middle of June. After that I engaged in carrying bluefish to Boston and fishing in the bay for codfish. In the autumn I fished for mackerel with gill-nets. In the winter I made cod-liver oil.

In 1866 I was in the sloop *Wave*, halibut fishing, as in springs before. After which carrying mackerel to market until June; and through the summer I engaged in the bluefish and dogfish fishery. In September I sold my vessel. That is when I coiled up my lines and quitted going vesseling.

Ever since that time I have been engaged in the manufacture of medicinal cod-liver oil and in smoking halibut brought from the Grand Bank.

In 1866 I bought 250 quintals of halibut, but was about three months smoking them, and the price fell, and I lost all my labor and \$500. The next spring I received a notification to deliver a course of lectures before the Lowell Institute, which I gave in the winter of 1868.* I smoked 400 quintals of halibut for Boston parties. In 1869, 1870, and 1871 I was in the fishery. Each and every year we smoked from 400 to 700 quintals of halibut, until the last three years. Last year we smoked 130 quintals, but the manufacture of cod-liver oil has been my main business.

* The lectures delivered by Captain Atwood at the Lowell Institute in 1868 were largely attended and very successful.—*Editor*.

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